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EFFECT OF ADDING ORGANIC ACID TO DIET IN SOME EGG QUALITY AND INTESTINAL ENVIRONMENT FOR QUAIL

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ABSTRACT

This study was conducted on quail to investigate the effects of some organic acids on egg qualities characters, enteric ecosystem and reproductive performance. One hundred eightybirds were reared from 1 day to 42 days of age, distributed to 3 treatments, (three replicates, 20 birds / replicate) . 1ST treatment (control) reared on standard ration, 2nd treatment reared on standard ration supplemented with Lactic acid (2.5 mg / kg ration), 3rdtreatment reared on standard ration supplemented with Citric acid (2.5 mg / kg ration). Statistical analysis of data showed that the addition of Organic acid improves significantly ($P \leq 0.05$) egg weight, albumen weight, yolk weight, height of albumen, high of yolk, yolk diameter, egg length, shape index, weight of first egg, age oflaying 50% egg laying intensity, weight of male reproductive system and length of oviduct as compared with control treatment . No significantly effects in yolk index, egg width, shell weight, shell thickness and internal shell membranes. Significant decrease in *Salmonella* and *E.Coli*. Significant increase in Lactobacillus content and significant increase in Lymphocyte % in male and females quail , in Hetrophils and Esinophils in females treated with Organic acid . Improved H/L ratio in Organic acid treatment as compared with control, andsignificant decreased ($P \leq 0.05$) in Coagulation timeand Cholesterol concentration in 2nd and 3rd treatment; In conclusion, organic acids improved the enteric ecosystem , egg quality and reproductive performances .

Key words: organic acid, bird quail, performance physiology , number bacteria .

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INTRODUCTION

One of the new challenges in the poultry industry is to search for natural additions to water and food to improve the efficiency of poultry especially when the European Union preventin (2006) the usage of antibiotics as growth promoter . The researchers began to attention to use alternative methods to improve the performance of poultry , including medical herbs , yeast and organic acids because of their effects in promoting the growth of beneficial bacteria and eliminate harmful bacteria and improve feed efficiencyand the health of poultry Khosravi ,et al (2010). Organic acids have been widely accepted as an alternative to antibiotics in poultry production , where it was observed when addition of organic acids to drinking water reduce the level of pathogens and improve digestion also improved growth (Philipsen, 2006). Organic acids were a short chain volatile fatty acids , most of which have been used to prevent the growth of microbes in feed it has been proven that it can be used in animal and poultry production as an effective and safe alternative to the antibiotics to stimulate growth , sustain immunity and prevent the

infection of many intestinal diseases , it been used as additives in feed or drinking water , the use of organic acids intensively in recent years has contributed to inhibiting the growth of harmful bacteria such as Salmonella in feedmaterialsused in fodder mixtures Radicliffe (2000) . Organic acids and their salt have been used as safe sources . This study was designed to determine the effect of the addition of some organic acids (Acetic and Lactic) to the quail ration in the egg quality and some enteric micro flora .

MATERIALS AND METHODS

The study was conducted in the poultry field Department of Animal Production / College of Agriculture and Frosty /University of Mosul for the period 1/May/2018 to 21/June/2018, birds were reared with dimensions of 50×50×50 Cm and provided with all the necessary management indices. The study continues from one day to the age of 42 days.One hundred eighty birds divided to 3 treatment ,with 3 replicates for each (20 birds/replicate) , T1(control)rearedon a standard ration , T2 reared on standard ration supplemented with (2.5 gm Lactic /kg ration) , T3 on standard ration supplemented with (2.5 gm Acetic acid/kg ration) . The prepared onstandard ration were compound according to (N.R.C. 1994), table (1).

Table (1): The components of the ration used in the study

Ingredients	Growth ration %	Productive ration %
Yellow corn	50	40
Wheat	—	21
Proteins Conentrate	15	10
Soybean Meal	31	22
Sun flower oil	3	2
Calcium	0.9	4.5
Salt	0.1	0.5
Total	100	100
Protein Ratio	24.04	20.16
Calculated energy kg / kg	2992.8	2841.6

N.R.C (1994)

When the birds reached the age of egg production the following parameters were calculated :Egg quality ,10 eggs from each replicate, weighed and broken to calculates , height albumin , yolk height ,yolk dimension, yolk weight, shell thicken, shell weight , shape index , yolk index . age of puberty , and weight of first egg and age of reach to 50% egg production .At the end of treatments, 12 birds from each treatment were slaughtered for the measurement of Oviduct, Ovary weight, length Oviduct, and estimate microbialcontent of intestines from bacteria E.Coli , Salmonella and Lactobacillus by method Harriganand McCance(1976). Blood samples were collected in heparinized tubes, smears were prepared for leukocytes count Campbell,(1995), also blood were collected in a plain tubes, then serum collected for. measurementConcentration of Cholesterol using kit (Biolabo , Maizy , France) and the time of clotting time using plain capillary tubes. The statistical

analysis was performed completelyrandomized design (C.R.D)one way analysis of variance differences between totals were determined using Duncan،s Multiple Ranges test (Duncan , 1955) for all the measurement studied and level of statistical characterize was (P≤ 0.05) as described by (Steel and Torri(1960) using SAS (2001) . program to analyses the data and using the following equation :

$Yij = \mu + ti + eij$.

Yij = Value of observation in the observation in the experimental .

μ = the general average .

ti = effect of treat .

eij = effect of the experimental error .

RESULT AND DISCUSSION

The resultsshowed in table (2) a significant increase in egg weight , albumin weight, yolk weight , albumin height , yolk height, egg length and shape index in T2 (lactic acid) and T3 (acetic acid) compared with control treatment at $P \leq 0.05$,non-significant difference in yolk index , shell weight , shell thickness and internal shell membranes for all treatments . These results were agreed with the result ofAL-Tamimi and AlZuhairi(2016) when addition of lactic acid and acetic acid caused significant increase in the albumenheight , yolk heightand yolk dimension . results also agreed with Kaya , et al (2014) showed asignificant difference in yolk height and yolk diameter when he add acetic acid to the quail ration, result , not agreed with Alp et al (1999) . Theimprovemention eggquality may be due to enhancement of albumin secretion from magnum so that the albumin weight and egg weight were increase significantly AL-Mashaekhly and Naji(1990).The results may be according to a positive correlation between the egg size and yolk size and the increase an egg size which cause increase in yolk dimension, resulting an increase in the yolk dimension of the egg AL-Fayadh and Naji(1989) . For the results were similar AL-Tamimi and AL-Zuhairi (2016) the results of the statistical analysis showed no significant different during production periods, also agreed with the finding of Kaya and Gul(2014) and also a result agreed with Soltan (2008) and Kaya and Gul (2015) there were no significant in shell weigh . While the results were not agreed AL-Tamimi and AL-Zuhairi (2016) where they pointed to significant in weight shell egg .

Table (3) revealed that quail ration of lactic acid and acetic acid caused a significant increase in the weight of 1st egg respectively compared with control at $P \leq 0.05$, also the treatments reduce significantly the age of 1st egg laying (puberty) for lactic acid and acetic acid treatment compared with control, as well as a significant decrease in the interval (age) to reach 50% of egg production for lactic acid and acetic acid treatments compared with control .

Table (2): Effect of organic acid treatments on egg weight and egg quality

Treatment parameters	Control treatment	Lactic acid (2.5%)	Acetic acid (2.5%)
Egg weight (gm)	11.00 ± 0.25 b	14.33 ± 0.36 a	13.50 ± 0.22 a
Albumenweight (gm)	5.02 ± 0.24 b	6.28 ± 0.16 a	6.34 ± 0.40 a
Albumen height (mm)	3.96 ± 0.16 b	4.84 ± 0.24 a	4.89 ± 0.25 a
Yolkweight (gm)	3.29 ± 0.09 b	3.94 ± 0.12 a	4.15 ± 0.19 a
Yolkheight (mm)	9.29 ± 0.24 b	10.67 ± 0.11 a	10.30 ± 0.81 a
Yolk diameter (mm)	20.81 ± 0.09 b	23.99 ± 0.45 a	24.43 ± 0.40 a
Egg Length(cm)	31.83 ± 0.36 b	33.98 ± 0.69 a	34.08 ± 0.61 a
Egg width(cm)	25. 53 ± 0.07 a	24.35 ± 0.36 a	24.78 ± 0.22 a
Shell weight (gm)	1.66 ± 0.19 a	1.86 ± 0.89 a	1.64 ± 0.02 a
Shell thicken(mm)	0.29 ± 0.04 a	0.25 ± 0.01 a	0.23 ± 0.01 a
Internal shell thicken (mm)	0.02 ± 0.004a	0.02 ± 0.002 a	0.02 ± 0.003 a
Shape index	1.24 ± 0.01 b	1.34 ± 0.02 a	1.37 ± 0.02 a
Yolk index	0.44 ± 0.01 a	0.44 ± 0.01a	0.42 ± 0.006 a

The values withdifferent horizontal letters indicate significant differences at the ($p<0.05$) .

Table (4) showed that quail ration supplementation with lactic acid and acetic acid improve the enteric ecosystem of the birds as represented in the significant reduction in the Salmonella and E.coli count in intestinal content and the significant increase in lactobacillus count as compared with control.

Table (3): Effect of organic acid treatments on weight of first egg , age at first egg laying intensity and age of 50 % of production

Parameters Treatment	1st egg weight (gm)	age of first egg laying (day)	Age of 50 % production (day)
Control treatment	9.66 ± 0.66 b	39.00 ± 0.75 a	43.33 ± 0.88 a
Lactic acid (2.5 %)	13.66 ± 0.33 a	35.66 ± 0.88 b	41. 33 ± 0.57 b
Acetic acid (2.5 %)	13.62 ± 0.35 a	36.66 ± 0.33 b	40.66 ± 1.20 b

The values with differentvertically letters indicate significant differences at the ($p<0.05$) .

These results agreed with the finding of Ali and AL-naimee (2006) where they showed significant decrease in the rate of the number of coliform bacteria when adding lactic and acetic acid compared with control treatment, results were in agreement with Line , et , al (1997) when add acetic and lactic acid in drinking water , and Mustafa et ,al (2014) where found significant increase in number lactobacillus bacteria when adding (1 % and 2 % acetic acids in drinking water compared with control treatment, While the addition of acetic acid caused significant decrease in number *E.Coli* bacteria and *enterococcus* compared with control treatment .This is due to the lower pH of intestine approach 6 which works to increased the inhibition of pathogenic bacteria such as *Salmonella* and *E.Coli* , the reason for the low numbers of bacteria is due to the ability of organic acids to

pended rate the wall of harmful bacteria and eliminate them , Peter theobald (2016), When reduce pH bacteria in digestive by the influence of organic acid to the wall of bacteria do the inhibits natural physiological function Gauthier (2002) . The increase in lactobacillus bacteria is due to the fact that bacterial are active in the acidic medium as opposed to harmful bacteria these are consistent with the results (Al-Kassi and Mohsen , 2009) .

Table (4) :Effect of organic acid treatments on some intestinal micro flora of quail

Parameters / Treatment	*Salmonella*	*E.Coli*	*Lactobacillus*
Control treatment	$16.83\times10^4 \pm 0.70$ a	$14.66 \times10^4 \pm 1.20$ a	$13.33 \times10^4 \pm 1.40$ b
Lactic acid (2.5 %)	$12.33\times10^4 \pm 0.49$ b	$11.83 \times10^4 \pm 0.47$ b	$19.83 \times10^4 \pm 1.86$ a
Acetic acid (2.5 %)	$11.66 \times10^4 \pm 0.88$ b	$11.33 \times10^4 \pm 0.99$ b	$17.16 \times10^4 \pm 1.37$ a

The values with different vertically letters indicate significant differences at the ($p<0.05$) .

Table (5) revealed that quail ration of lactic acid and acetic acid caused a significant increase in the relative weight of right testis and weight of left testis with lactic acid and acetic acid compared with control , also the treatments increase significantly the length of oviduct compared with control treatment . No significant differences in ovary weight and oviduct weight .

Table (5): Effect of organic acid treatments on relative weight of parts of male and female reproductive system and length of Oviduct

Treatment / Parameters	Control treatment	Lactic acid (2.5%)	Acetic acid (2.5 %)
weight reproductive system%	3.81 ± 0.35 a	4.47 ± 0.42 a	3.90 ± 0.12 a
weight Ovary%	2.01 ± 0.19 a	2.40 ± 0.1 a	2.20 ± 0.08 a
weight Oviduct%	1.80 ± 0.20 a	2.07 ± 0.29 a	1.70 ± 0.08 a
Length Oviduct (Cm)	29.95 ± 0.55 b	33.75 v 0.47 a	32.75 ± 0.4 a
weight right testis%	1.49 ± 0.14 b	1.86 ± 0.08 a	1.87 ± 0.11 a
weight left testis%	1.38 ± 0.11 b	1.90 ± 0.05 a	1.61 ± 0.14 a

The values with different horizontal letters indicate significant differences at the ($p < 0.05$)

Table (6) showed that quail ration supplementation with lactic acid a significant increase in relative Lymphocytes cell for male and female acetic compared with the male and female control treatment. No significant differences showed between treatment in relative hetrophilecells ,esimophil cells , basophil for male and female . Significant increase in % monocyte cells for male in acetic and lactic acid and in lactic acid in female . Significant decrease in hetrophile cell in acetic and lactic acid as compared with control and decrease in monocyte cell in female in acetic acid treatment significant decrease in esinophil cell in female of lactic and acetic acid treatment. L/H ratio decrease in female and male in acetic and lactic acid as compared with control . This was accompanied by a significant decrease H/L ration and enhancing physiological performance Houshmandet,al (2012). The results agreed with research Yusuf et,al (2016) where it was found that the addition of

organic acids lead to differences in the Lymphocytes and Hetrophils ration and ration H/L compared with the control treatment .

Table (6): Effect of organic acid treatments on the differential count of white blood cells

Treatment / parameters	Sex	Control treatment	Lactic acid(2.5 %)	Acetic acid (2.5 %)
% Lymphocyte	Female	72.00 ± 1.08 b	77.50 ± 0.95 a	79.50 ± 0.50 a
	Male	75,00± 1.58 b	81.00 ± 0.70 a	78.75 ± 0.94 a
% Hetrophile	Female	16.00 ± 1.08 a	12.50 ± 0.74 b	13.00 ± 0.40 b
	Male	12.50 ± 1.04 a	10.25 ± 0.94 a	12.50 ± 0.64 a
% Monocyte	Female	6.75 ± 0.47 a	7.00 ± 0.70 a	4.50 ± 0.50 b
	Male	7.50 ± 0.64 b	4.75 ± 0.64 b	4.75 ± 0.40 a
% Esinophil	Female	4.50 ± 0.95 a	2.25 ± 0.47 b	2.75 ± 0.62 b
	Male	4.25 ± 0.85 a	3.00 ± 0.81 a	3.25 ± 0.25 a
%Basophile	Female	0.75 ± 0.25 a	0.75 ± 0.25 a	0.25 v 0.25 a
	Male	0.75 ± 0.25 a	0.75 ± 0.25 a	0.50 ± 0.28 a
H/L ratio	Female	0.222 ± 0.01 a	0.158 ± 0.006 b	0.166 ± 0.006 b
	Male	0.170 ± 0.01 a	0.125 ± 0.01 b	0.175 ± 0.008 ab

The values with different horizontal letters indicate significant differences at the ($p<0.05$) .

Table (7) showed significant decrease in cholesterol concentration of lactic and acetic acid treatments as compared with control. Acetic acid treatment caused to significant decrease in coagulation time compared with control treatment , but no significant differences between lactic and control treatments .

[Table (7): Effect of organic acid treatments on Concentration of Cholesterol and Coagulation time of quail]

Treatment / Parameters	Control treatment	Lactic acid (2.5 %)	Acetic acid (2.5 %)
Cholesterol (mg/dl)	191.443 ± 3.71 a	152.069 ± 4.77 c	168.021 ± 4.55 b
Coagulation time (second)	32.50 ± 1.36 a	28.83 ± 1.88 ab	26.66 ± 2.10 b

The values with different horizontal letters indicate significant differences at the ($p<0.05$) .

تأثير إضافة الأحماض العضوية إلى العليقة في بعض الصفات النوعية للبيضة وبيئة الأمعاء لطائر السمان

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الخلاصة

أجريت هذه الدراسة على طائر السمان لمعرفة تأثيرات بعض الحوامض العضوية في الصفات النوعية للبيضة وبيئة الأمعاء والصفات التناسلية. استخدم (180) طائر قسمت على 3 معاملات وفي كل معاملة 3 مكررات وفي كل مكرر 20 طائر واستمرت الدراسة (42) يوم، المعاملة الأولى (السيطرة) تناولت العليقة القياسية، المجموعة الثانية تناولت العليقة القياسية مضاف إليها (2,5 ملغم حامض اللاكتيك / كغم علف)، المعاملة الثالثة تناولت العليقة القياسية مضاف إليها (2,5 ملغم حامض الخليك / كغم علف). أظهرت نتائج التحليل الإحصائي أن المعاملة بالحوامض العضوية قد حسنت معنوياً (أ≥0,05) وزن البيضة، وزن البياض، وزن الصفار وأرتفاع البياض وأرتفاع الصفار وقطر الصفار وطول البيضة ودليل الشكل، كما حسنت من وزن أول بيضة والعمر عند وضع أول بيضة والوقت اللازم للوصول إلى 50% من الإنتاج، أثرت الأحماض العضوية معنوياً في وزن الجهاز التناسلي الذكري مقارنة مع معاملة السيطرة. ولم يلاحظ وجود فروقات معنوية في دليل الصفار وعرض البيضة ووزن القشرة وسمك القشرة وغشائي القشرة .

أنخفض عدد االبكتريا الضارة في الأمعاء (السالمونيلا و E.Coli) بينما أرتفع عدد بكتريا Lactobacillus وحصول أرتفاع معنوي في نسبة الخلايا اللمفاوية بالنسبة للذكور والإناث كما تحسنت نسبة الخلايا المتغايرة إلى الخلايا اللمفاوية في كافة المعاملات مقارنة بمعاملة السيطرة . انخفضت نسبة الخلايا المتغايرة والخلايا الحمضة للإناث في المعاملات المضاف لها الأحماض العضوية. بينما لوحظ أنخفاض معنوي في زمن التخثر ومستوى الكوليستيرول في المعاملتين الثانية والثالثة مقارنة مع معاملة السيطرة. بشكل عام أن الحوامض العضوية حسنت من بيئة الأمعاء والصفات النوعية للبيضة والأداء التناسلي لطائر السمان.

الكلمات المفتاحية: أحماض عضوية، السمان، الصفات الفسلجية، العد البكتيري.

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