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Investigation on effects of fat source on broiler intestinal pathogens

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ABSTRACT

Since the grain and especially corn is used as energy source in poultry diets, but they can not provide the required energy and due to the beneficial effects of animal fat and plant fat resources, so this experiment used to evaluate the effects of single or combined fats with animal and plant origin in poultry diet on broiler population cecum microflora. Treatments included the first treatment with 4% animal fat of tallow, the second treatment with 4% fat plant of canola oil, the third treatment with 4% plant fat of sunflower oil, the fourth treatment with 2% animal fat of tallow + 2% plant fat of canola oil and the fifth treatment with 2% animal fat of tallow and 2% plant fat of sunflower oil. The results showed that adding plan and animal fat had no statistically significant effect on microbial population of Coliforms bacteria (P>0.05), but addition of fat sources on microbial populations of Escherichia coli was statistically significant effect (P<0.05).

Keywords: pathogen, intestine, oil, chicks

INTRODUCTION

Application of poultry fat in the diet has many benefits. One of these advantages is that several experiments have shown growing broilers body weight gain in consumption of fats [1, 2, 3].

Since the grain and especially corn is used as energy source in poultry diets, but they can not provide the energy needed to feed and due to the beneficial effects of animal fat and plant fat resources, so this experiment used to evaluate the effects of single or combined fats with animal and plant origin in poultry diet on broiler population cecum microflora.

MATERIALS AND METHODS

This experiment was done in 2011 in poultry hall of Islamic Azad University, Rasht Branch, Rasht, Iran. This study was performed on 200 male chicks strain at Ross 308. Roosters were divided into categories and each ten roosters formed a repeat. Ten roosters in a pen by the walls were made of metal mesh were reared separately. Approximate dimensions of the hall was twenty-five square meters within 5 m^2 width and dimensions of each pen was considered 1.5×1 m^2. Mentioned conditions were all run the same for breeding cockerel. And pens were distributed randomly in the halls.

Studied treatments

In the first treatment 4% animal fat of tallow was used. In the second treatment, 4% plant fat of canola oil was used. In the third treatment, 4% plant fat of sunflower oil was used. In the fourth treatment, animal fat of tallow 2% + plant fat of canola oil 2% was used. In the fifth treatment, animal fat of tallow 2% + plant fat of sunflower oil 2% was used.

Compounds of consumed feed

Composition of used dietary and nutrient composition of diets used in this study is shown in the following Tables 1 and 2.

Table 1. Used diets during experimental periods

Ingredient	Starter	Grower	Finisher
Corn (%)	54.5	58.5	62.7
Soybean meal (%)	37.5	33.5	29.5
Oil or Fat (%)	4	4	4
DL-Methionine (%)	0.18	0.21	0.15
DL-Lysine (%)	0.07	0.09	0.01
Ca22%:P18%	1.6	1.5	1.5
CaCO3 (%)	1.2	1.2	1.1
Bicarbonate	0.12	0.14	0.1
NaCl (%)	0.23	0.26	0.25
Vitamin & Mineral Mixture (%)	0.6	0.6	0.6
Total (%)	100	100	100

Table 2. Nutrients Analysis of used diets during experimental periods

Ingredient	Starter	Grower	Finisher
Crude Protein	21.04	19.60	18.18
Energy (ME) (kcal/kg)	3010	3050	3100
Lysine (SID) (%)	1.27	1.10	0.97
Methionine (SID) (%)	0.47	0.42	0.36
Met+Cys (SID) (%)	0.94	0.84	0.76
Tryptophan (SID) (%)	0.20	0.18	0.16
Arginine (SID) (%)	1.31	1.14	1.02
Iso-Leucine (SID) (%)	1.04	0.95	0.94
Valine (SID) (%)	1.60	1.07	1.03
Leucine (SID) (%)	1.99	1.87	1.82
Calcium (%)	1.05	0.90	0.85
Ava.Phosphorus (%)	0.50	0.45	0.42
Sodium (%)	21.04	19.60	18.18
Potassium (%)	0.50	0.40	0.40
Mg (%)	0.05	0.06	0.05
Cu (%)	16	16	18
I (mg)	1.25	1.25	1.25
Fe (mg)	40	40	40
Mn (mg)	120	120	120
Se (mg)	0.30	0.30	0.30
Zn (mg)	100	100	100
Vitamin A(SID) (IU)	11000	9000	9000
Vitamin E (SID) (IU)	75	50	50
Vitamin K (mg)	3	3	2
Vitamin B12 (mg)	0.016	0.016	0.010
Riboflavin (mg)	8	6	5

Method of preparation medium

Mechanical preparation of agar medium (solid medium)

Some of the powder medium (50 per liter) was poured into the Erlenmeyer flask. The required amount of water was added to the flasks. Erlenmeyer flask was shaken until the powder is dissolved in water. In order to make smooth and transparent was boiled in water bath or was placed on the hot plate. In the next step, was placed inside the autoclave for Fifteen to twenty minutes in the temperature of 121ºc to be sterilized. It out of the autoclave to be completely dry. After cooling medium along the flame was transferred to the target plate.

Preparation of E.M.B. Agar medium (solid medium)
Some of the powder medium (36 per liter) was poured into the Erlenmeyer flask. And the required amount of water was added to the flasks. Erlenmeyer flask was shaken until the powder is dissolved in water. In order to make smooth and transparent was boiled in water bath or was placed on the hot plate. In the next step, was placed inside the autoclave for Fifteen to twenty minutes in the temperature of 121ºc to be sterilized. It out of the autoclave to be completely dry. After cooling medium along the flame was transferred to the target plate.

Peptone water
Some of the powder medium (76.5 per liter) was poured into the Erlenmeyer flask. The required amount of water was added to the flasks. Erlenmeyer flask was shaken until the powder is dissolved in water. In order to make smooth and transparent was boiled in water bath or was placed on the hot plate. In the next step, was placed inside the autoclave for Fifteen to twenty minutes in the temperature of 120ºc to be sterilized. It out of the autoclave to be completely dry. After cooling medium along the flame was transferred to the target plate. In each tube 10cc was poured. This solution was used for dilution of samples obtained from intestinal blind.

Dilution was so that one gram of blind intestinal contents of broilers was thoroughly mixed with 1cc of peptone water solution. Then this 1cc poured in the tube No.1 and thoroughly mixed. Finally it took 1 cc again and then was transferred to the next tube. This trend continued until the tube number eight for each replication. At the end, 1cc removed from the final tube and discarded. Finally, 1cc removed from the pair tubes (numbers two, four, six and eight) and inside the flame were transfer to medium and were cultured. Medium preparation stage and Culture carried out a day before sampling.

Data analysis Methods
This experiment was performed in a completely randomized design. Data was initially entered into Excel. Normality test was performed and if necessary the appropriate transformation has been used. Then data were analyzed with SPSS software. And averages were compared by Tukey test. The statistical model was as follows:

$$X_{ij}=M + T_j + e_{ij}$$

In this formula, Xij represents the value observed in each experiment; M is the average of the whole population through the samples was evaluated by assuming null hypothesis, Tj represents the effects of each group or test diet and eij represents the error effects. Therefore, number value of any observed from the total of treatment effects, error and population total mean was obtained.

Traits in this experiment were colony counts of *Escherichia coli*, and colony counts of *Coliforms* bacteria.

RESULTS

Obtained results are summarized in Table 3.
Effect of fat source on *Escherichia coli*
Comparison of fat source effects showed that diet fat type had significant effect on the *Escherichia coli* of the broiler chickens ($P<0.05$). The comparison of data obtained showed that 2nd treatment statistically had the most effect on the *Escherichia coli* of broiler chickens, and this difference was statistically significant ($P<0.05$) followed by 5th treatment, 4th treatment, 3rd treatment and 1st treatment had the lowest effect on *Escherichia coli*.

Effect of fat source on *coliforms* bacteria
Comparison of fat source effects showed that diet fat type had not significant effect on the coliforms bacteria of the broiler chickens ($P>0.05$). The comparison of data obtained showed that 5th treatment had the most effect on the coliforms bacteria of broiler chickens and followed by 1st treatment, 2nd treatment, 4th treatment and 3rd treatment had the lowest effect on coliforms bacteria.

DISCUSSION

In the study of intestinal bacteria population was observed that adding fat sources had no statistically significant effect on coliforms bacteria ($P>0.05$), but addition of fat sources on the microbial population of *Escherichia coli* had statistically significant effect ($P<0.05$).

Other authors [4] in their experiment reported the significant effect of unsaturated oils to saturated oils in the diet of broiler chickens on the increase of total bacteria population ($p<0.05$) that was rejected by the results of the present plan ($P>0.05$). Other authors [5, 6] in their experiments found that use of unsaturated fats in the diet of broiler chickens increased the population of lactobacillus bacteria ($P<0.05$) that is not confirm with the results of this project ($P>0.05$).

Table 3- Mean comparison (±SEM) of cecum microflora among five studied treatments*

Trait / Treatment	*Escherichia coli* [cfu/gr]	Coliforms bacteria [cfu/gr]
1 (Animal fat: tallow; 4%l)	1133334^{ab}±1125457	5375002^{a}±1863854
2 (Plant fat: canola oil: 4%)	6666679^{a}±1666604	4400003^{a}±3999986
3 (Plant fat: sunflower oil; 4%)	4900000^{bc}±1550268	2000000^{a}±1547002
4 (Animal fat + plant fat; tallow: 2% + canola oil 2%)	5366667^{c}±2130988	3366668^{a}±1963272
5 (Animal fat + plant fat; tallow 2% + sunflower oil 2%)	5525000^{c}±2085741	7466670^{a}±4205297

** There is significant difference between the numbers that are shown with the different letter(s) in each column (P<0.05). Each column of data without any letter has not significant differences (P>0.05).*

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