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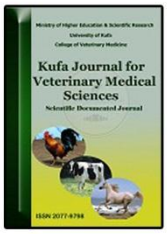

Effect of Supplementing Different Sources and Levels of Omega-3 in Ration on Body Weights of Broilers

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Abstract:

A total of 200 male chicks (Ross 308) were divided randomly at day-old into equal 5 treatments groups (40 birds each treatment), as following: T1/ birds fed basal diet without supplement with omega-3 fatty acids (as control group) while T2, T3, T4 and T5/ birds fed basal diet supplement daily with 0.25 and 0.5% respectively from flaxseed oil and fish oil during experiment period (35 days). Results revealed significant improvement of mean live body weights at age 35 days for T3, T5 and T2 while T4 not appeared significant difference compared with T1(control group). The present study was carried out to determinate body weights of male broilers when fed on rations contains different sources and levels of omega-3 fatty acids.

Keywords: Male broilers, Omega-3 fatty acids, Body weights.

تأثير تجهيز العليقة بمصادر ونسب مختلفة من اوميغا-3على أوزان جسم فروج اللحم

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الخلاصة:

استخدم 200 فرخ ذكر من نوع (روز 308) حيث قسمت عشوائيا بعمر يوم واحد إلى خمسة معاملات متساوية (كل معاملة تحوي 40 طير)، وكما يلي: المعاملة الأولى/غذيت عليقة أساسية بدون أن تجهز بالأحماض الدهنية اوميغا-3 (اعتبرت مجموعة سيطرة) بينما المعاملة الثانية، الثالثة، الرابعة و الخامسة/غذيت بصورة متتالية على عليقة أساسية تجهز يوميا بزيت بذور الكتان و زيت السمك بنسبة 0.25 و0.5% على التوالي خلال فترة التجربة (35 يوم). بينت النتائج حصول تحسن معنوي في معدلات أوزان الجسم الحي بعمر 35 يوم للمعاملة الثالثة، الخامسة والثانية على التوالي بينما لا يوجد هناك فرق معنوي في المعاملة الرابعة مقارنة بالمعاملة الأولى (السيطرة). أجريت الدراسة الحالية لمعرفة أوزان جسم ديكة فروج اللحم عندما تغذى على علائق تحتوي على مصادر ونسب مختلفة من الأحماض الدهنية اوميغا -3.

Introduction:

Food components are playing important roles in preventing diseases by modulating physiological systems **(1)**. Fats and oils are commonly supplemented to broiler rations to increase the energy that consider an economic tool to producing rich energy

formulations **(2)**. The structure of fatty acids contains carbon, oxygen and hydrogen, which divided to two types: saturated fatty acids and unsaturated fatty acids that subdivided to monounsaturated fatty acids and polyunsaturated fatty acids (PUFAs) **(3)**. Flaxseed oil is a good source of α-linolenic acid (ALA) while Fish oil eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) which called omega-3 fatty acids (N-3) **(4)**. N-3 have a long chain of carbon atoms with more than two double bonds in there structures **(5)**. Also it's essential because can not synthesized endogenously in the body so it must be obtained from diet **(6,7)**. And commercial diets are usually low in N-3 fatty acids **(8)**. In veterinary medicine there was a wide range of studies and researches on metabolic and inflammatory problems are major causes of morbidity and mortality in broiler production **(9,10)**. Understanding the role of dietary N-3 PUFAs in birds may increase our knowledge in increasing broiler productivity, reducing disease and thereby contributing to increased economic returns to the poultry industry **(11)**. Thus, this experiment was conducted to find out effect using flaxseed oil or fish oil in ration formulation on body weights of male broilers.

Materials and Methods:

1- **Experimental design**

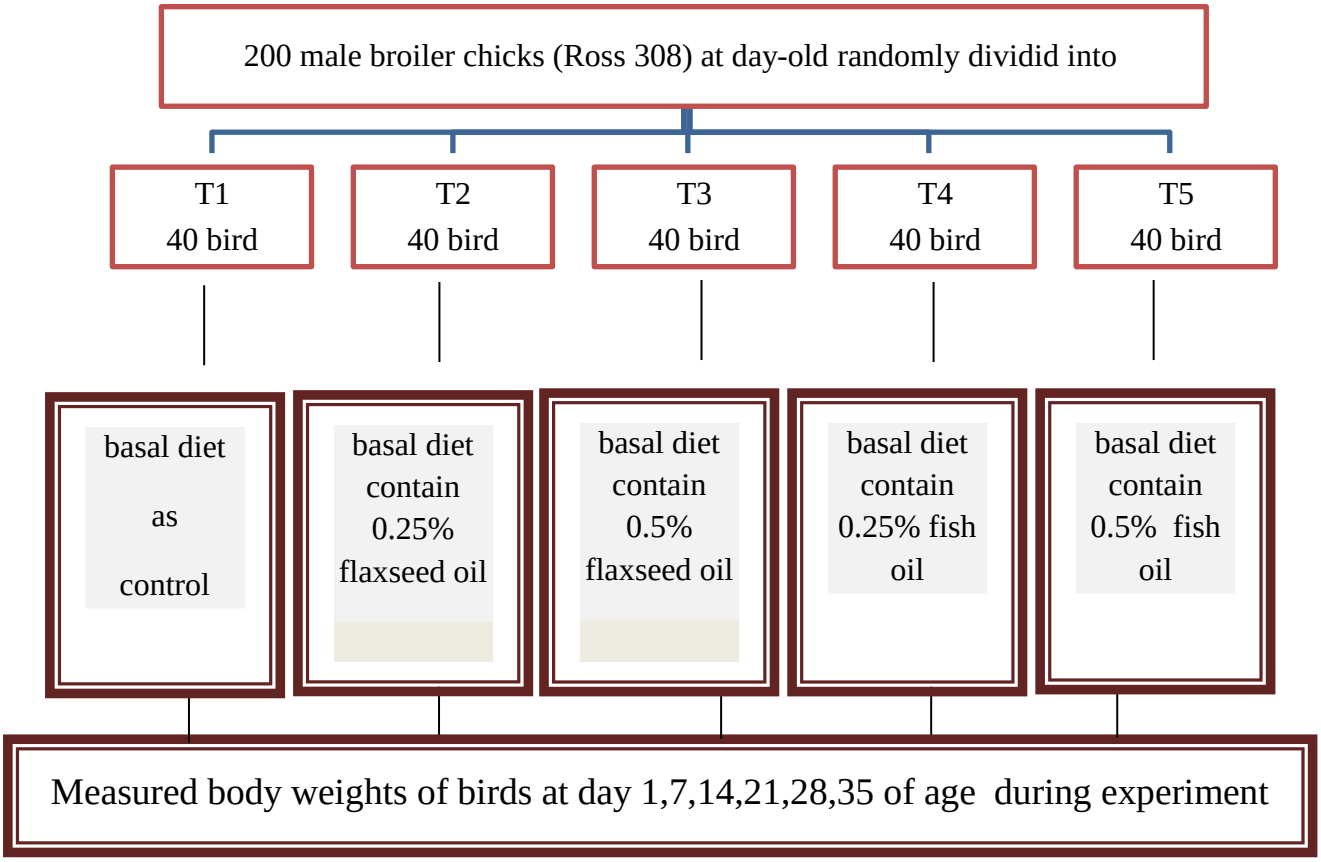

Figure 1 experimental design

2- **Management, Feeding and protective program during experiment**

This experiment was carried out at the field of poultry, College of Veterinary Medicine, Baghdad University during the period from 5/12/2011 until 9/1/2012. A total of two hundred day-old male broiler chicks (Ross-308) were purchased from local hatchery (that contains specialized and training staff on vent sexing method). And were housed at a well–ventilated and disinfected and the management of the five treatments groups was identically carried out. Feed and water were provided *ad libitum* during the whole period of experiment which lasted five weeks. Two types of diets were used over the period of experiment. Starter diet was used from day one to 21 days of chicks' age and then finisher diet was used till the end of the experiment (Tables 1 and 2). The chicks were allocated randomly for five treatment groups (40 chicks for each group). The treatments groups were (T1 as control); (T2 contain 0.25% flaxseed oil*); (T3 contain 0.5% flaxseed oil); (T4 contain 0.25% fish oil**); and (T5 contain 0.5% fish oil), the different sources and levels of N-3 in ration mixed daily. Chicks were vaccinated against Newcastle disease (ND) (B1) and infectious bronchitis at one day of age by spray while all others vaccines administrated with drinking water which includes: ND (Lasota) at age 10 days, Gumboro (IBD2) at age 14 days, ND (Lasota) at age 20 days and ND (Lasota) at age 30 days. As well as Vitamin C was added at the rate of 1gm/liter and also vitamins AD3E at the ratio of 0.5ml/liter

for 3 days after each vaccination and for 3 days. duration of

** Flaxseed oil produced in Iraq,AL-EMAD factory contains 250 ml from crude flaxseed oil and ME 8890 kcal

* Fish oil produced in USA contains 100 ml from crude fish oil and ME 9000 kcal

Table 1: Composition of experimental diets (starter) according to **(12)**

Starter diet (1- 21day)					
Ingredient %	T1	T2	T3	T4	T5
Yellow corn	36	36	36	36	36
Soybean meal(48% protein)	30	30	30	30	30
Wheat	26	26	26	26	26
Protein concentrate*	5	5	5	5	5
Sunflower oil	1.5	1.25	1	1.25	1
Flaxseed oil	-	0.25	0.5	-	-
Fish oil	-	-	-	0.25	0.5
Premix**	0.1	0.1	0.1	0.1	0.1
Lime stone	1	1	1	1	1
Salt	0.3	0.3	0.3	0.3	0.3
Dicalcium phosphate***	0.1	0.1	0.1	0.1	0.1
Total	100	100	100	100	100
Calculated chemical analysis					
Metabolize energy (kcal/kg)	2926	2925.7	2925.4	2926	2926
Crude protein (%)	22.4	22.4	22.4	22.4	22.4
Calcium (%)	0.82	0.82	0.82	0.82	0.82
Available phosphorus (%)	0.61	0.61	0.61	0.61	0.61
Methionine (%)	0.61	0.61	0.61	0.61	0.61
Lysine (%)	1.74	1.74	1.74	1.74	1.74

* Protein concentrate produced in Belgium (INTRACO®) which contains: crude protein 40%; ME kcal/kg 2100; crude fat 3.5%; crude fiber 1%; calcium 6%; available phosphorous 3%; lysine 3.25%; methionine 3.5%; methionine +cysteine 3.9%; sodium 2.2%; iron 1000 mg; copper 100 mg; manganese 1200 mg; zinc 800 mg; iodine 15 mg; selenium 2 mg; cobalt 6 mg; vit A 200000 IU; vit D3 40000 IU; vit E 500 mg; vit B1 15 mg; vit B2 100 mg; vit B6 20 mg; vit B12 300 mg; vit k3 30 mg; choline chloride 5000 mg; folic acid 10 mg; biotin 100 mg; antioxidant 900 mg.

** Premix produced in Jordan (VAPCO®) which contains: vit A 8000000 IU; vit D3 1500000 IU; vit E 1000 IU; vit K3 2000 mg; vit B1 500 mg; vit B2 500 mg; vit B6 200 mg; vit B12 8 mg; ca pantothenate 400 mg; nicotinamide 6000 mg; folic acid 50 mg; methionine 13 mg; lysine 61 mg; aspartic acid 92 mg; glutamic acid 166 mg; cysteine 1 mg; valine 40 mg; tyrosine 9 mg; glycine 382 mg; arginine 117 mg; leucine 48 mg; phenylalanine 40 mg; Mn sulphate 0.40 gm; zinc sulphate 0.15 gm;

iron sulphate 0.50 gm; copper sulphate 0.04 gm; cobalt chloride 0.01 gm.

*** Dicalcium phosphate produced in Iraq which contains: Available phosphorus 18%; Calcium 22%.

Table 2: Composition of experimental diets (finisher) according to **(12)**

Finisher diet (22-35day)					
Ingredient %	T1	T2	T3	T4	T5
Yellow corn	44	44	44	44	44
Soybean meal(48% protein)	26	26	26	26	26
Wheat	20	20	20	20	20
Protein concentrate*	5	5	5	5	5
Sunflower oil	3.5	3.25	3	3.25	3
Flaxseed oil	-	0.25	0.5	-	-
Fish oil	-	-	-	0.25	0.5
Premix**	0.1	0.1	0.1	0.1	0.1
Lime stone	1	1	1	1	1
Salt	0.3	0.3	0.3	0.3	0.3
Dicalcium phosphate***	0.1	0.1	0.1	0.1	0.1
Total	100	100	100	100	100
Calculated chemical analysis					
Metabolize energy (kcal/kg)	3097.8	3097.5	3097.2	3097.8	397.8
Crude protein (%)	20.5	20.5	20.5	20.5	20.5
Calcium (%)	0.80	0.80	0.80	0.80	0.80
Available phosphorus (%)	0.58	0.58	0.58	0.58	0.58
Methionine (%)	0.58	0.58	0.58	0.58	0.58
Lysine (%)	1.63	1.63	1.63	1.63	1.63

* Protein concentrate produced in Belgium (INTRACO®) which contains: crude protein 40%; ME kcal/kg 2100; crude fat 3.5%; crude fiber 1%; calcium 6%; available phosphorous 3%; lysine 3.25%; methionine 3.5%; methionine +cysteine 3.9%; sodium 2.2%; iron 1000 mg; copper 100 mg; manganese 1200 mg; zinc 800 mg; iodine 15 mg; selenium 2 mg; cobalt 6 mg; vit A 200000 IU; vit D3 40000 IU; vit E 500 mg; vit B1 15 mg; vit B2 100 mg; vit B6 20 mg; vit B12 300 mg; vit k3 30 mg; choline chloride 5000 mg; folic acid 10 mg; biotin 100 mg; antioxidant 900 mg.

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*** Dicalcium phosphate produced in Iraq which contains: Available phosphorus 18%; Calcium 22%.

3- **Measured of body weights**

The chicks were weighed individually at age 1, 7, 14, 21, 28 and 35 day per pen by using digital balance then calculated average body weights for each treatment.

4- **Statistical analysis**

Data generated from experiment was carried out in a complete randomized design **(13)**. These data were subjected to ANOVA according to general linear model procedure of SAS software **(14)**. The significant differences among means were determined by using Duncan's multiple range tests. Differences among treatment means were compared at ($p \leq 0.05$).

Results:

The effect of supplementing different sources and levels of omega-3 fatty acids on the live body weights are presented in (Table 3). That refers to different in body weight of birds among groups of experiment during growth periods. Body weight at the age of marketing in Iraq are important in the broiler production. Therefore the highest significant increase in the fifth week was determined in T3 (containing o.5% flaxseed oil) and T5 (containing o.5% fish oil) which were weighted (2043.50 gm) and (2021 gm) respectively than T2 (containing o.25% flaxseed oil) which were weighted (1955.70 gm) while T4 showed no significant increased in weight compared with the control group.

Table 3: live body weights of birds (gm) during period of experiment

Age / Treatment	1st day	1st week	2nd week	3rd week	4th week	5th week
T1	39.70 ±0.27 a	168.80±1 .08 a	390 ±2.78 d	812 ± 3.64 b	1280 ±5.48 b	1850 ±12.40 c
T2	40.10 ±0.33 a	171.10±1 .30 a	425.30 ±2.23 b	872.50±4 .46 a	1367.35± 9.45 a	1955.70± 17.74 b
T3	40.50 ±0.30 a	171.60±1 .07 a	450.60 ±2.90 a	876 ± 4.38 a	1371 ±6.60 a	2043.50± 19.27 a
T4	40.40 ±0.36 a	165.30±0 .93 b	383.70 ±1.65 d	798.10±4 .57 c	1258 ±9.83 c	1896 ±16.95 c
T5	39.60 ±0.25 a	168.50±0 .76 a	415.65 ±2.21 c	882.80±3 .23 a	1370.50± 5.32 a	2021 ±16.53 a

(T1: control); (T2: flaxseed oil 0.25%); (T3: flaxseed oil 0.5%); (T4: fish oil 0.25%); (T5: fish oil 0.5%).

Numbers represented: mean ± standard error.

Small similar letters in same column denoted that no significant differences between treatments at a level ($p \leq 0.05$).

Small different letters in same column denoted that significant differences between treatments at a level ($p \leq 0.05$).

Discussion:

They are many reasons may be explain relationship of high and low levels from flaxseed and fish oil to enhance public health of boilers which lead to improvement final body weight because of flaxseed oil as a rich of N-3 called ALA **(4)**. And ALA bioconversion to EPA and DHA **(15)**. Therefore it's considered as a source of 3 types of N-3 (ALA, EPA, DHA). ALA independent of it's conversion to EPA and DHA may be play an important role in many physiological functions like potential benefits include cardio protective effects, Modulation of the inflammatory response and a positive impact on both central nervous system function and behavior **(16)**. While fish oil as a good source of 2 types of N-3 (EPA and DHA) **(4)**. At same time N-3 found in the phospholipids membrane all cells of body **(5)**. But are especially rich in the brain, retina, myocardium, immunity cells, pulmonary, spermatozoa and others **(17,18,19)**. And play roles associated with integrity (rigidity and form) and functionality during many cellular processes (signaling, cellular development, gene expression) **(20)**. Several studies have shown better utilization of unsaturated fats more then saturated fats **(2)**. And N-3 specifically EPA promote oxidation of mitochondrial fatty acids due to the high content of stronger and more readily oxidizable bonds between carbon and hydrogen **(21)**. This finally led to increase dietary metabolic energy take place the bird. Oils rich with N-3 considers as growth activation during activate bile which lead to increase digestion of fats in diet **(22)**. And increase efficiency of digestion and absorption of intestine lead to more useful from diet **(23)**. Also N-3 may be causes increase secretion of serotonin and dopamine levels, two important neurotransmitters that can affect on mood **(24)**. And animal became calm and decrease loss of energy and stress. Also type of dietary fat and time of feeding attenuating immune tissue lipid content **(11)**. And long chain N-3 PUFA showed to improve the immune response and reduce inflammation in different species such as chicken, mice and fish **(25)**. My results agreement with **(26)** showed final body weight of broilers significantly improved by fed on a ration contain vegetable and animal protein with 0.5% cod liver oil. Also **(8)** found supplementing diet of quail with 3% fish oil and flaxseed oil lead to significant improvement body weight. While disagreement with **(27)** added 0.8% fish oil to the diet of broilers and demonstrated decrement of body weight of treatment group compared with control group. And **(28)** not recorded significant differed in body weight of laying hens at the age 23, 26, 30, 34, 38, 42 and 46 week when ration supplement with 0.5, 0.75 and 1% fish oil and flaxseed oil (as a source of N-3).

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