EFFECTS OF FEEDING DIFFERENT LEVELS OF FLAXSEED ON PERFORMANCE TRAITS AND BLOOD PARAMETERS IN BROILER.

Mashaan A. Al-zuhairy* **Meisaa G. Taher****

*Prof. - Dept. of Public Health- College of Veterinary Medicine- Univ. of Baghdad.
**Dept. of Pathology- College of Medicine- Univ. of Diyala . Zahidma1977@yahoo.com

ABSTRACT

This study was aimed to investigate the effect of feeding different levels of flaxseed supplementation in the diet of broiler chicks on some production parameters and hematological parameters. A total of 150 (one day old) Ross chicks were randomly divided into three equal groups, control group (Group 1) was fed on basal diet without flaxseed supplementation, treatment group (Group 2) was fed diet supplemented flaxseed in the level of 5% and (Group 3) was fed diet supplemented with flaxseed in the level of 10% for 42 days. The results revealed significant ($p<0.05$) increase of weekly body weight and improvement of feed conversion ratio of treatment groups compared with control group and significant ($p<0.05$) increased of RBC count, WBC count and PCV %. While there were no- significant differences in Hb concentration between control and treatment groups.

Key words: Flaxseed, broiler , Blood parameters .

INTRODUCTION

Flaxseed is an oil seed, which it is rich in fat 41%, protein 20% and dietary fiber 28%, moisture 7.7% and 3.4% ash(Anonymous, 2001). The composition of flaxseed can vary with genetics, growing environment, seed processing and method of analysis (Daun *et al*., 2003).

Flaxseed is rich in polyunsaturated fatty acids (PUFA), especially alpha linolenic acid (ALA), which is an omega-3 fatty acid. ALA constitutes about 57% of the total fatty acids in flaxseed, making flaxseed one of the richest natural sources of ALA. Linoleic acid (LA), which is an omega-6 fatty acid, constitutes about 16% of total fatty acids(Morris,2003).

Consumers are becoming more aware of the effect of food they eat on their health. One of the ways they hope to reduce their risk of cardiovascular disease is by consuming more foods enriched with n-3 polyunsaturated fatty acids

Received for publication June 9 , 2013 .

Accepted for publication Sept. 22 , 2013 .

(PUFA). In recent years attention was focused on the relationship between increased human consumption of Omega 3 fatty acids and lowered incidence of human coronary heart disease (Najib and Al-Yousef, 2011).

It has been shown that consumers prefer poultry meat and its products for several reasons. The most important being the health point - lower fat level and better fatty acid composition as compared to beef and pork along with economical justification .Unlike other animal fats, around two third of poultry fat is composed of unsaturated fatty acids, and they are belonged to omega-3 (n-3) and omega-6 (n-6) fatty acids. In poultry, it is common that dietary fat has a great influence on fatty acids profiles of poultry meat(Krejcí-Treu *et al*., 2010).

MATERIALS AND METHODS

This experiment was carried out in the Poultry Farm, College of Veterinary Medicine- Baghdad University. The experiment lasted 42 days, started from 8/12/2012 up to 18/1/2013. A total of 150 one day old broiler chicks (Ross strain) were randomly assigned to three experimental treatments. Each treatment consisted of two replicates with 25 birds each. The bird were reared in floor pens each pen was three square meters with one hanging tube feeder and one suspended drinker. The experiment was a completely randomized design and dietary treatments were as follows:Group 1 was fed the basal diet withoutflaxseed and kept as a control group. Group 2 was fed the basal diet with flaxseed 5%. Group 3 was fed the basal diet with flaxseed 10%.

Control diet was formulated according to the NRC (1994) nutrient requirements for broiler chickens and the other 2 diets were prepared separately using the same ingredients as in the control diet and supplements incorporated to basal diet on a weight: Flaxseed added and mixed thoroughly. Feed and water wereoffered ad*libitum* and the light program was 23L / 1D.

Measured of body weights and FCR :

The chicks were weighted individually on days 1, 7, 14, 21, 28, 35, and 42 for each pen. by using digital balance then calculated average body weights and FCR for each treatment.

Hematological Parameters:

Five individual blood samples were collected from each replicate for each analysis in a test tube with EDTA from the main brachial vein of the bird , to determine the PCV, Hb, RBCs and WBCs count at 20 and 40 of age.

Statistical analysis:

Statistical analysis was applied by using Statistical program SPSS and Analysis of Variance (ANOVA) and used Least significant difference (L.S.D) for detect the significant differences between means of treatments (Snedecor and Cochran ,1980).

Table ١: *The composition of experimental diets.*

Ingredient (%)	Diet 1 control 0% Flaxseed	Diet 2 5% Flaxseed	Diet 3 10% Flaxseed
Flaxseed	0	5	10
Yellow Corn	51.4	37.5	35
Soybean(45%protien)	31	30	27.5
Wheat bran	1	2.5	7.5
Wheat	14	22.4	17.4
* Premix	1	1	1
Salt(NaCl)	0.3	0.3	0.3
Methionine	0.2	0.2	0.2
Lysine	0.1	0.1	0.1
Dicalciumphosphate	1	1	1
Total	100	100	100
	Calculated chemical analysis		
ME(Kcal/kg)	3051	3041	3047
Crude protein (%)	21.58	21.8	21.5

*Premix: (1%) provided the following (per kg of complete diets), 1400 IU Vit . A, 3000 IU Vit . D3, 50mg Vit . E, 4gm Vit .K , 3mg Vit. B6, 6mg Vit. B12 , 60 mg niacin , 20 mg pantothenic acid , 0.2 mg folic acid , 150 mg choline , 4.8 mg Ca , 3.18 mg P,100 mg Mn , 50mg Fe , 80mg Zn , 10 mg Cu , 0.25mg Co , 1.5 mg Iodine. Chemical composition according to **(NRC 1994).**

RESULTS AND DISCUSSION

Performance traits:

Mean live body weights of the bird in the different treatments are presented in Table (٢). During the first period (0-3weeks old) control group showed non-significant (P<0.05) lower mean live body weight between treatments . While during the second period (4-6 weeks of age) group 2 (5% flaxseed) and group 3(10% flaxseed) recorded a significant (P<0.05) increase in live body weight as compared with control group. Mean live body weight of group 3(10% flaxseed) was significantly (P<0.05) higher than 5% flaxseed treatment.

This significant increase through the 4-6 weeks and the whole experimental period may be due to the fact that this increase could be due to the presence of essential oils in flaxseed,because flaxseed rich with omega-3 lead to activate the bile increase digestion of fats in the intestine, increase efficiency of digestion and absorption of diets in intestine lead to more useful from the diet. Several workers have also reported similar improvement in body weight (Azouz, 2001; Tucker ,2002 ; Alcicek *et al* ., 2004; Osman *et al* .,2004 and Abdel-Azeem, 2006).

Furthermore, Efterpi *et al*.(2006) showed higher final body weight also in average of breast and thigh meat weights in birds fed diets contained 3% and 10% flaxseed compared with control groups.

These results are in agreement with Sahib *et al*., (2012) that explained the relationship between levels of flaxseed oil and broiler public health which lead to improve final body weight due to the enrichment offlaxseed oil with n-3 called ALA **(**Stulnig, 2003 **)**, and ALA bio converted to EPA and DHA **(**Brenna *et al*.,2009**)**. Therefore it's considered as a source of 3 types of n-3 (ALA, EPA, DHA). Several studies have shown better utilization of unsaturated fats more than saturated fats (Al-yaseen and Abdul-abass, 2010).

Al Daraji *et al*.,2011, however found supplementing diet of quail with 3% fish oil and flaxseed oil lead to significant improvement body weight. In addition, Çabuk *et al.* (2006) found better productive parameters of broilersfed mixture of essential oils and improved significantly in feed conversion ratio which can be attributed to more effective availability of nutrients.

Table 2: *Effect of different levels 0f flaxseed on weekly body weight (gm) of broiler (mean + SE).*

Treatments / weeks	0% Flaxseed(Control)	5% Flaxseed	10% Flaxseed
1st week	193.2±4.2	198 ±3.5	211.2±6.3
2nd week	449.5 ±13.9	483.7±6.6	512.5±9.8
3rd week	808.3±23.8	849±14.3	901.8±17.8
4th week	1293.7±22.3 b	1347±19.1 ab	1384±9.8 a
5th week	1875.8±31.2 b	1973.3±34.57 ab	2075±68.6 a
6th week	2556.6±105.4 c	2683±140.7 b	2788.3±143.7 a

*Different letters horizontally denote significant (P<0.05) difference among mean groups.

The results (Table ٣) revealed during first period (0-4) weeks that no Significant (P<0.05) differences were observed. While significant (P<0.05) differences were observed in feed conversion ratio between treated and control group in the last two weeks , they recorded (2.25±0.23, 1.93±0.09, 1.91±0.1) in fifth week, and (2.21±0.2, 1.86±0.42, 1.75±0.16) in sixth week for control,group2 and group3respectively.

These results were supported with the findings of Roy *et al*. (2008) who indicated that there was an improvement in feed conversion ratio and they refereed to that the dietary fat spare protein and amino acids from energy yielding processes and direct them towards the growth of the animals. They observed 35% increase in the net weight gain along with about 30% increase in the daily instantaneous growth rate and 30% decrease in FCR with 10% supplementation of PUFA indicates the PUFA as growth promoting substance. Al-Zuhairy and Alasadi (2013)found that feed conversion ratio were improved significantly ($p \leq 0.05$)in flaxseed group as compared with control group.

Table 3: *Effect of different levels of flaxseed on Feed Conversion Ratio (gm feed intake/gm weight) of broiler (mean ± SE).*

Treatments / weeks	0% Flaxseed(Control)	5% Flaxseed	10% Flaxseed
1st week	2.21±0.06	2.18±0.05	2.01±0.14
2nd week	1.75±0.09	1.64±0.05	1.56±0.05
3rd week	1.58±0.09	1.48±0.06	1.39±0.08
4th week	2.3±0.1	2.1±0.14	2.2±0.11
5th week	2.25±0.23 a	1.93±0.09 b	1.91±0.1 b
6th week	2.21±0.2 a	1.86±0.42 a	1.75±0.16 b

*Different letters horizontally denote significant (P<0.05) difference among mean groups.

Hematological parameters

The hematological parameters exhibited significant (P<0.05) differences between treatments compared with control group.The results of this study showed significant differences (P<0.05)of blood picture including RBC counts, WBC counts, PCV between treatments and control group (Table 4,5,٦). Treatmentwith 5% and 10% flaxseed recorded the highest values in all hematological parameters at age of 20 and 40 days. Within groups, significant ($p < 0.05$) increasein RBC counts, WBC counts ,PCV were recorded in 10% flaxseed group as compared with 5% flaxseed group but, there were no-significant differences (P<0.05)in hemoglobin percentage between treatments and control groups (Table 7).

The improvement in red blood cells count occur in 5% and 10% flaxseed groups due to highly speed growth and causing an increase in live body weight, body

weight gain, all these make the birds suffered from metabolic stress represented by deficiency of oxygen in the blood "hypoxemia" and this led to make bone marrow enhance and increase producing red blood cells to face high metabolic requirements of oxygen (Price *et al.*, 1998). Table (4).

Table 4: *Effect of different levels of flaxseed on RBC ($10^6/mm^3$) of broiler (mean ± SE).*

Treatments / Days	0% Flaxseed(Control)	5% Flaxseed	10% Flaxseed
20 days	1.870±0.20 c	2.390±0.21 b	3.100±0.23 a
40 days	2,000±0.10 c	2.500±0.10 b	3.008±0.40 a

*Different letters horizontally denote significant (P<0.05) difference among mean groups.

Table (5) showed an increase in WBC counts in treated groups compared with the control group this may be attributed to the direct effect on the haemopoetic tissue (Khodary *et al.*, 1996) or to the production of specific or non-specific antibodies against different antigens (El-Feki,1987).Furthermore, may be attributed to enhancement of cellular functions due to implementing these studied feed additives in broiler diets.

Table 5: *Effect of different levels of flaxseed on WBC (cell/mm^3) of broiler (mean ± SE).*

Treatments / Days	0% Flaxseed(Control)	5% Flaxseed	10% Flaxseed
20 days	12460.7±484.7 b	13740±1155.3 ab	14650±849.3 a
40 days	15400±2303.4 b	22166.6±333.7 a	22833.3±601. a

*Different letters horizontally denote significant (P<0.05) difference among mean groups.

The analysis of results of hematological tests demonstrated that the application of flaxseed had no effect on value of hemoglobin. However, it resulted in a significant ($P \leq 0.05$) increase of the total number of red blood cells contents and leukocytes (WBC) in the blood of chicks from flaxseed group at 40 days age. As the birds were in good condition, this was not so much a sign of a disease but a sign which might have been related to the immunomodulatory properties of the active components of flaxseed, namely, a high content of omega-3 fatty acids, which influence various immune mechanisms, inter alia,

modulate the process of phagocytosis, the activity of NK cells and the production of cytokines (Calder *et al*. 2011; Kelley*et al*. 1988).

These results are in agreement with Al-Daraji *et al*.,(2010) they showed that flaxseed group had a highest ($p<0.05$) means of erythrocyte number, PCV, hemoglobin concentration and leukocyte number, Followed by the values of corn oil and fish oil group, when they were determine the effects of dietary supplementation with different fat sources on blood parameters.

Table 6: *Effect of different levels of flaxseed on PCV% of broiler (mean ± SE).*

Treatments / Days	0% Flaxseed(Control)	5% Flaxseed	10% Flaxseed
20 days	25±0.6 c	26.87±0.4 b	31.57±0.6 a
40 days	27.5±0.6 B	30.4±1.1 a	32±1.1 a

Different letters horizontally denote significant ($P<0.05$) difference among mean groups

Table 7: *Effect of different levels of flaxseed on Hb(g/dl) of broiler (mean ± SE).*

Treatments / Days	0% Flaxseed(Control)	5% Flaxseed	10% Flaxseed
20 days	8.2±0.5	8.5±0.5	8.7±0.9
40 days	7.8±0.3	8.2±0.2	8.3±0.2

From the results obtained, it could be conclude that ,Using 5 % and 10% flaxseed in the broiler rations demonstrates good results in the blood picture and production performance .

REFERENCES

Abdel-Azeem, F. 2006. Effect of using fenugreek and fennel seeds asnatural feed additives on performance of broiler chicks. *Egypt. J. Nurt.Feeds*, 9: 277-297.

Anonymous. 2001. Nutritional profile of no. 1 Canada Western flaxseed and of yellow flaxseed samples. Canadian Grain Commission, Winnipeg, MB.

Azouz H. M. M. 2001. Effect of hot pepper and fenugreek seeds supplementation on broiler diets. Ph.D. Thesis, Faculty of Agric., Cairo University, Egypt. pp: 181.

Al-Daraji, H.J., A.S. Al-Hassani , H.A. Al-Mashadani, W.K. Al-Hayani and H.A. Mirza. 2010.Effect of Dietary Supplementation with Sources of Omega-3 and Omega-6 Fatty Acids on Certain Blood Characteristics of Laying Quail .*International Journal of Poultry Science* 9 (7): 689-694.

Al Daraji, H. J.,H. A. Al Mashadani, H. A.Mirza,W. K.Al Hayani and A. S.Al Hassani. 2011. Effect of feeds containing different fats on certain carcass parameters of Japanese quail. *A.R.P.N Journal of Agri. and Biol. Sci.*, 6(6): 6-11.

Al-zuhairy M.A. and Y.J. Alasadi.2013.Effect of in ovo injection with Newcastle Disease Vaccine, Multivitamins AD3E, and Omega-3 on performance and immune response of broilers. *International Journal of advanced Biological Research,* 3 (2) : 208 – 211 .

Al-yaseen, A. A. and M. H. Abdul-abass. 2010. Textbook of poultry Nutrition. The Iraqi Ministry of Higher Education and Scientific Research. Baghdad University, College of Agriculture.(In Arabic).

Alcicek, A., M. Bozkurt and M. Cabuk. 2004. The effect of a mixture of herbal essential oils, an organic acid or a probiotic on broiler performance. *S. Afr. J. Anim. Sci.*, 34: 217-222.

Brenna, J. T.,N. S. Jr, A. J. Sinclair and S. C. Cunnane. 2009. Alpha linolenic acid supplementation and conversion to N-3 long-chain polyunsaturated fatty acids in humans. *Elsevier*, 80: 85-91.

Cabuk, M.,M. Bozkurt, A. Alcicek, S.Y. Akba and K. Kucukylmaz. 2006. Effect of a herbal essential oil mixture on growth and internal organ. weight of broiler from young and old breeder flocks .*South Afr. J .Sci*., 36 (2):135-141 .

Calder P.C.,P. Yaqoob, F. Thies, F.A. Wallace and E.A.Miles. 2011. Fatty acids and lymphocyte 498 functions. *Brit. J. Nutr*. 87, 31–48.

Daun JK, V.J. Barthet, T.L. Chornick and S. Duguid.2003. Structure, composition, and variety development of flaxseed. In: Flaxseed in Human Nutrition, edsThompson LU and Cunnane SC, 2nd ed, AOCS Press, Champaign, IL, pp.1-40.

Efterpi V., P.C.Christaki, P. D.Florou- Paneri, A. S.T.Fortomaris, and A. L. Yannakopoulos .2006. Effects of dietaryinclusion of natural zeolite and flaxseed on broiler chickens' body fat deposition in an extended fattening period. Arch.Geflügelk., 70 (3). S. 106–111, 2006, ISSN 0003-9098. Saorolegnia.Ph.D. Thesis, Aston Univ., Birmingham, U. K**.**

Kelley D.S. , G.J.Nelson, C.M.Serrato, P.C.Schmidt and L.B.Branch, 1988. Effects of type of dietary fat on indices of immune status of rabbits. *J. Nutr*. 118, 1376–1384.

Khodary, R. M.; M. H.El-Azzawy and I. R.Hamdy.1996.Effect of nigella sativa on egg production, hatchability percentage and some biochemical values in laying hens with reference to fertility in cockerels. (7^{th}) Sci. Cong. Fac. Vet. Med. Assuit Univ., 17-19 Nov. Assuit, Egypt. 91-106.

Krejcí-Treu, T., E. Straková, P. Suchý and I. Herzig. 2010. Effect of vegetable oil fortified feeds on the content of fatty acids in breast and thigh muscles in broiler chickens. *Acta Vet. Brno*.79:S21-S28.

Morris, D.H. 2003. Flax- A Health and Nutrition Primer. Availablefrom http://www.flaxcouncil ca.[Accessed: 12/03/04]. 9-10, 14-17, 20-27, 30, 64.

Najib,H and M.W. Al-Yousef. 2011. Performance and Essential Fatty Acids Content of Dark Meat as Affected by Supplementing the Broiler Diet with Different Levels of Flaxseeds .*Annual Review & Research in Biology*, 1(2): 22-32, 2011.

National Research Council (N.R.C.).1994.Nutrient requirement of poultry .9th edition Washington DC national academy of science press .Washington,DC.

Osman, M., K.H. Amber andM.A.Mahmoud.2004. Response of broiler chicks performance to partial dietary inclusion of radish, rocket and parsley cakes. *Egypt. Poult. Sci*., 24: 429-446.

Price, N. T., V. N.Jackson and A. P.Halestrap. 1998. Cloning and sequencing of four new mammalian monocarboxylate transporter (MCT) homologues confirms the existence of a transporter family with an ancient past. *Biochem. J*.,329, 321-328.

Roy, R., S. Singh, and S. Pujari. 2008. Dietary role of omega – 3 polyunsaturated fatty acid (PUFA): a study with growing chicks, Gallus domesticus. *Int. J. Poult.Sci.* 7(4):360-367.

Sahib A.M., A.H. Al-Hillaliand A.F. Al-Khalisy. 2012.Effect of Supplementing Different Sources and Levels of Omega-3 in Ration on Body Weights of Broilers.*Kufa Journal For Veterinary Medical Sciences* Vol. (3) No. (2) 127-135.

Snedecor ,G.W.and W.G.Cochran .1980.Statistical method .7th edition , lowa State University press ,Ames ,lowa.

Stulnig, T. M. 2003. Immunomodulation by polyunsaturated fatty acids: mechanisms and effects. Int. Arch. Allergy Immunol., 132: 310-321.

Tucker, L. 2002. Botanical broiler: Plant extracts to maintain poultry Performance.*Feed Int*., 23: 26-29.

تأثير إضافة مستويات مختلفة من بذور الكتان إلى عليقة نباتية في الأداء الأنتاجـــي والمعايير الدمية لدجاج اللحم .

مشعان عباس الزهيري* **ميساء غني طاهر****

*أستاذ - كلية الطب البيطري- جامعة بغداد .
** كلية الطب – جامعة ديالى .Zahidma1977@yahoo.com

المستخلص

هدفت هذه الدراسة إلى تقييم تأثير إضافة بذور الكتان بنسب مختلفة إلى عليقة دجاج اللحم في الأداء الإنتاجي وبعض الصفات الدمية ، استخدمت في هذه التجربة ١٥٠ طير من افراخ اللحم نوع روز ووزعت بصورة عشوائية على ٣ مجموعات متساوية على النحو الآتي :-

المعاملة الأولى :-أعطيت عليقة اعتيادية بدون أضافه بذور الكتان (مجموعة سيطرة).

المعاملة الثانية :-أضيف ٥ % من بذور الكتان الى العليقة الاعتيادية طيلة فترة التجربة البالغة ٤٢ يوما.

المعاملة الثالثة :-أضيف ١٠ % من بذور الكتان الى العليقة الاعتيادية طيلة فترة التجربة البالغة ٤٢ يوما.

وقد بينت النتائج وجود زيادة معنوية ($p<0.05$)في وزن الجسم الحي الاسبوعي،كفاءة التحويل الغذائي، عدد خلايا الدم الحمر و البيض وحجم خلايا الدم المرصوصة في المجاميع الثانية والثالثة لكن لم تظهر فروق معنوية بمستوى خضاب الدم مقارنة مع مجموعة السيطرة .

الكلمات المفتاحية : بذور الكتان ، دجاج اللحم ، المعايير الدمية .