

Effect of Diets Containing Various Dietary Oil Sources on Blood Parameters and Carcass Composition of Broilers

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Abstract

Effects of diets containing fats on blood parameters and some carcass characteristics were investigated. Broilers were fed one of four different isonitrogenous diets containing 5% added fat (Soybean oil, Corn oil, Sunflower oil and Vegetable oil). The effect of different fat sources on the protein ratios of thigh and breast muscles of broilers was statistically not significant. The effect of different fats on serum cholesterol and mean lipoprotein in broilers was significant ($p < 0.01$), but the effect of those on triglyceride values was not significant. The effect of sex on blood parameters for cholesterol and triglyceride values was not statistically significant, significant ($p < 0.05$) for lipoprotein.

Keywords: oil, vegetable oil, carcass, blood, broiler.

Introduction

There have been numerous reports on the effects of added fats in poultry diets. Although the effects of fats and vegetable oils have been examined on diet quality and performance of animals in the previous studies, today, direct or indirect effects of fats on animal and human health are being determined. On the basis of the previous results, the effects of fats and vegetable oils need to be examined not only for production characteristics but also for meat quality and blood parameters relative to human health. When fat-related studies on chicken are scrutinized, it is found that the fats and vegetable oils according to their energy and fatty acid characteristics affect the production (Ozdogn & Sari 2001, Waldroup & Waldroup 2005 and Rondelli, et al 2004) meat quality (Lee, et al 2003, Ajuyah, et al 1991) and blood characteristics of broilers (Ozdogan & Akşit 2003, Ferreira, et al 1999). When the studies were examined regarding the physiology and fat metabolism of chickens.

Materials and Methods

Three hundred eighty four male and female 1 day old broiler chicks (Cobb 500) were used. The birds were individually weighed and placed randomly in 16 floor pens (12 male and 12 female chicks per pen). There were four dietary treatments with three replicates (pens) each. The experimental treatments were Formulated to meet (National Research Council., 1994) recommendations for

all nutrients. Analyses of meat compositions were made using procedures of the Association of Official Analytical Chemists (Association of Official Analytical Chemists (A.O.A.C.),1990). The diets consisted of 5% added fat from four different sources and were formulated to be nitrogenous (Table 1). The fats used included soybean oil (SO); corn oil (CO), sunflower oil (SFO) and vegetable oil (VO). All chicks were fed with starter diets up to 21 day then were fed with grower diets from 22 to 42 day. The diets were fed ad libitum.

Data Collection

Prior to slaughter, broilers were given a feed withdrawal period of 12 hours to decrease the effects of feeding on blood parameters of the chicken. Before slaughter, two male and two female chickens were given a feed withdrawal period of 12 hours to decrease the effects of feeding on blood parameters of the chicken. Before slaughter, two male and two female chickens were randomly selected from replicate for each of the four treatments for blood sampling and carcass analysis. Blood samples were obtained from each bird by jugular vein puncture and drawn into vacuumed capillary tubes in order to determine the blood cholesterol, triglyceride, mean lipoprotein levels. Chemical analyses for protein, fat, moisture and ash were performed on all meat samples.

Statistical Analysis

Analysis of variance of the data was conducted by using pen means. Differences among treatments were determined with Duncan's multiple-range test. All statistical analyses were performed using (SAS Institute.,1985) statistical programs. The effects of different fat sources added in the diets on broiler meat composition are shown in (Table 2).

Results and Discussion

The effect of feeding different fat sources on the protein content of thigh and breast muscle was not significant. These findings were obtained from this research are supported by those of other researchers (Mendes, et al 1995). The crude fat content of thighs and breasts were found to be significantly different ($p < 0.01$). The fat percentage of thighs and breasts was highest in broilers fed diets containing sunflower oil, whereas those fed diets containing soybean oil were the lowest. It is theorized that this might have resulted from the high crude cellulose in the sunflower oil and vegetable oil grower diets. The moisture content of thigh muscle was significantly higher in broilers fed a diet containing soybean oil ($p < 0.05$) compared to sunflower oil, but breast muscle was not affected. Sunflower oil was comparable to the other three fat sources, but breast

muscle was not affected. The ash contents of the thigh muscle ($p < 0.05$) and breast muscle ($p < 0.01$) were found to be significantly different as a result of feeding different fats. The diets containing vegetable oil had the highest ash content compared to sunflower oil diets with the lowest levels. As the moisture content of the meat decreased, the fat content appeared to increase. Because of this negative relationship between fat and moisture percentages in the meat, the evaluation of fat together with moisture values of chicken meat may give better results than either one alone. In other words, as the amount of moisture in meat decreased, the fattening increased in the carcass (Table 2). This situation can give us some ideas on carcass fattening. Other researches on this subject support the negative relationship between carcass moisture and fat of content (Hrdinka,etal 1996, Coon, etal 1981). Cholesterol, triglyceride, mean lipoprotein values in serum of broilers fed with diets containing different fat sources are shown in (Table 3). Cholesterol, mean lipoprotein values in blood serum of broilers fed with different fat sources were significantly different ($p < 0.01$), whereas triglyceride values were not. A negative relationship between cholesterol and triglyceride values was observed in the groups fed sunflower oil and corn oil added in diets. The cholesterol values of the groups fed with diet containing sunflower oil were the lowest, and the triglyceride values of those were the highest in all treatments. The cholesterol values of groups fed the corn oil diets were highest, and the triglyceride values were the lowest in all treatments. In previous studies, animals fed diets rich in cholesterol or saturated fat had elevated carcass cholesterol and blood cholesterol levels. Therefore, diet ingredients can be manipulated to change blood values (Ferreira,etal 1999, Sanz,etal 2000). It is found that diets containing different fat sources did not affected blood cholesterol values. Although the mean lipoprotein value was the highest in the groups fed with diet containing corn oil, this value was lowest in the groups fed with vegetable oil added in diet (Hulan,etal 1984). Researchers (Verma,etal 1995 , Corzo, etal 2004) have shown that increased serum mean lipoprotein is able to decrease the negative effect of high blood cholesterol. The effect of sex on mean lipoprotein values was found to be statistically significant. The cholesterol values of males and triglyceride values of females were found numerically higher. The value for blood parameters measured in male and female are agreement with values reported in previous studies (Ferreira,etal 1999 , Sanz,etal 2000).

Table1:Composition of the experimental diets

Ingredients	Age(day)	
	1 - 21	22 - 42
	Starter Diet%	Grower Diet%
Wheat	61.825	67.825
Soybean meal	26	20
Meatandbone meal	5	5
SO,CO,SFO,VO ¹	5	5
Limestone	0.8	0.8
Sodium chloride	0.3	0.3
DL-Methionin	0.1	0.1
Dicalisium osphate	0.5	0.5
Mineral Premix	0.1	0.1
Choline	0.3	0.3
Cocciostat	0.075	0.075
ME,Kcal/Kg ²	3031	3070
CP%	21.9	20.1
DL-Methionin	0.49	0.46
Crude fat%	7.5	7.4
Crude fiber%	3.6	3.4
Calisium%	0.83	0.82
Phosphorus%	0.42	0.41

Table2: Effect of different fat sources on broiler meat composition

Treatments	Crude Protein%	Crude fat%	Moisture %	Ash%
Thigh muscle				
Soybean Oil	16.34 ^a	13.88 ^c	69.04 ^a	0.82 ^{ab}
Corn Oil	15.82 ^a	14.23 ^b	69.65 ^{ab}	0.83 ^{ab}
Sunflower Oil	16.45 ^a	16.89 ^a	68.62 ^b	0.79 ^b
Vegetable Oil	15.97 ^a	14.74 ^b	68.31 ^{ab}	0.89 ^a
Significance.	NS	**	*	*
Breast muscle				
Soybean Oil	19.27 ^a	11.51 ^b	68.32 ^a	1.01 ^{ab}
Corn Oil	18.93 ^a	12.09 ^a	68.12 ^a	1.22 ^{ab}
Sunflower Oil	19.66 ^a	13.32 ^a	67.85 ^a	0.89 ^a
Vegetable Oil	18.84 ^a	12.89 ^b	67.67 ^a	1.42 ^a
Significance.	NS	**	NS	**

[1]Diet containing fat sources: SO=Soybean oil, CO=Corn oil, SFO=Sunflower oil, VO=Vegetable oil
 [2]This was found to with calculation.

^{a-c} Means within columns for each characteristic with no common superscript differ significantly.
¹ Sig. =Significance. * p<0.05; ** p<0.01

Table 3: Blood parameters of broilers fed with different fat sources

Treatments	Cholesterol	Triglyceride	Mean lipoprotein
	mg/100 ml		
Soybean Oil	114.02 ^b	40.45 ^a	55.62 ^b
Corn Oil	129.93 ^a	38.37 ^a	61.83 ^a
Sunflower Oil	103.63 ^c	42.45 ^a	55.75 ^c
Vegetable Oil	105.77 ^c	40.62 ^a	51.79 ^b
Significance	**	NS	**
Male	114.98 ^a	39.20 ^a	57.10 ^a
Female	111.60 ^a	42.24 ^a	52.60 ^c
Significance	NS	NS	*

^{a-c} Means within columns for each characteristic with no common superscript differs significantly.* p<0.05; ** p<0.01

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تأثير إضافة مصادر الزيوت المختلفة للعليقة على بعض صفات الدم و أجزاء الذبيحة لفروج اللحم

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الخلاصة

تم دراسة تأثير إضافة مصادر الزيوت المختلفة الى علائق فروج اللحم على صفات الدم و أجزاء الذبيحة، وزعت الطيور على أربعة معاملات مختلفة بأضافة ٥% من (زيت فول الصويا، زيت الذرة الصفراء، زيت عباد الشمس و الزيت النباتي) لكل معاملة على حدة. كان تأثير الزيوت على نسبة البروتين في عضلات الفخذ و الصدر غير معنوي، بينما تأثير هذه المجاميع من الزيوت على نسب البروتين، الرماد و الرطوبة في عضلات الفخذ و نسب البروتين و الرماد في عضلات الصدر تأثيرا معنويا ($p < 0.05$ و $p < 0.01$). تأثير مصادر الزيوت المختلفة على كوليسترول الدم و البروتينات الدهنية كانت معنوية ($p < 0.01$) بينما لم تكن تلك التأثيرات معنويا على الكليسيريدات الثلاثية. أن للجنس تأثيرا معنويا ($p < 0.05$) على البروتينات الدهنية و غير معنوي على الكوليسترول و الكليسيريدات الثلاثية.