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Research article

Effect of different levels of golden flaxseed (*Linum usitatissimum* L.) powder on some blood biochemical parameters in male and female broiler

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Abstract

The objective of this experiment was to determine the effects of dietary supplementation of golden flaxseed powder on some blood quality biochemical in male and female broiler. A total of 180 unsexed, Ross broiler chicks were randomly divided into four treatment groups. Chicks in each treatment group were sub-divided into three replicates (15 chicks for each replicate). The treatment groups were as follows: T1: Control group; T2: fed on a diet supplemented with 12% flaxseed; T3: fed on a diet supplemented with 14% flaxseed; T4: fed on a diet supplemented with 16% flaxseed. The result showed that serum protein and albumin decreased significantly ($P<0.05$) in male and female broiler fed with 16% flax seeds. Further AST and ALP increased significantly ($P<0.01$) in male and female broiler fed with the highest level of flaxseed (16%). All other parameters remained unchanged ($P>0.05$) between control and experimental groups. It can be concluded from the study that the use of flaxseed powder at higher concentrations in the diet led to a reduction of blood protein and increased liver enzymes in male and female broiler.

Keywords: Flaxseed; powder; blood quality; broilers

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Introduction

Flax (*Linum Usitatissimum L.*) is one of the oldest agricultural crops that were planted in temperate regions of Asia and Europe since seven thousand years. Inscriptions on the walls of many of the ancient ruins suggest that flax was used by humans for 10,000 years ago (Vaisey Genser and Morris, 2003). Flaxseed is grown as oil crop, as fibre crop and oil is extracted from oilseed varieties. A large proportion of flaxseed comprises nutritional components such as oil, soluble fibre, protein, lignin, vitamins and minerals (Anjum et al., 2013). Flaxseed contains polyunsaturated fatty acids in high levels, saturated fatty acid in low rates, fibre in low rates with plenty of potassium, and small amounts of magnesium, iron, copper, zinc and various vitamins. According to an estimate 100 g flax seed carried 13.4 mg vitamin E, 450 kcal energy, in addition, the amino acid profile of flax seed displayed characteristics similar to soy flour (Moghaddasi, 2011). Furthermore, flaxseed is frequently recommended by physicians due to its healthy profile of N-3 fatty acid. Flaxseed possesses protection against cancer by intervening sex hormones and prevents tumour cells from growing (Moghaddasi, 2011). The current study aimed to find out the effect of different levels of golden flaxseed powder (12, 14 and 16%) on some of the blood biochemical characteristics of male and female broiler.

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Materials and Methods

A total of 180 chicks (Ross-308) was maintained in an open sided poultry house equipped with water, feeder and lighting system. The chicks were divided randomly into four treatments with three replicates per treatment. Birds were fed on the starter diet for 1-21 days and the finisher diet for 22-42 days (Table 1). Flaxseeds were added into the feed at three levels (0, 12, 14 and 16%) as a powder. The control and experimental diets were identical in their content of metabolisable energy, crude protein, essential amino acid, calcium and available phosphorus but differed in fatty acid.

Blood samples were collected from the birds at the end of the experiment (day 42) from three male and female broilers for each repeater by slaughter (jugular vein). Blood was centrifuged at 3000 r/min for 15 minutes and put the samples after separation in plastic tubes. Total protein and albumin in the blood were measured by the method described by Wooton and Freeman (1982). Globulin was determined by subtracting albumin from total protein. Serum aspartate aminotransferase (AST), and alanine aminotransferase (ALT) were determined according to the method described by Reitman and Frankel (1957). Alkaline phosphatase (ALP) was determined according to the kit method (Bio Lab Reagent).

Data were analyzed statistically by ANOVA using a completely randomized design (CRD). In case of significance difference, multiple range test was used (Duncn, 1955). Statistical software SAS, 2001 was used to carry out statistical analysis.

Results

Serum biochemical parameters including serum protein, albumin, globulin, total albumin and total

Table 1: Ingredient and calculated composition of the diets fed for broiler

Ingredients (%)	Start diet				Finisher diet			
	T1	T2	T3	T4	T1	T2	T3	T4
Yellow corn	30	18	17	15	57.5	25	34.5	38.5
Wheat	30	37	38	38	6	35	23	19
Soybean meal[1]	30	25	23.5	23.5	25.5	18.5	19.5	18.5
Flaxseed powder[2]	-	12	14	16	-	12	14	16
Protein concentrate[3]	5	5	5	5	5	5	5	5
Oil vegetable	3	1	0.5	0.5	4	2.5	2	1
Premix vitamin[4]	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Sodium chloride	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Limestone	1	1	1	1	1	1	1	1
Dicalcium phosphate	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total	100	100	100	100	100	100	100	100
Calculated content[5]								
ME (kcal/kg)	2987	2986	2983	2997	3199.5	3199.5	3199.5	3175.5
Crude protein (%)	22.7	22.7	22.3	22.6	19.8	19.9	19.9	19.8
Crude fiber (%)	2.56	3.13	3.22	3.31	2.31	3.03	3.04	3.10
Calcium (%)	0.79	0.81	0.81	0.81	0.82	0.84	0.85	0.85
Available phosphorus (%)	0.55	0.54	0.55	0.56	0.48	0.44	0.51	0.50
Methionine (%)	0.55	0.59	0.60	0.60	0.41	0.51	0.46	0.53
Lysine (%)	1.22	1.08	1.06	1.07	1.02	0.92	0.95	0.94

[1]Soy bean was used containing 48% protein and 2230 ME (kcal/kg); [2]Flaxseed contained 24% crude protein and 3957 ME/kg (Batal and Dale, 2012); [3]Protein concentrate provided per kg: 40% crude protein; 2150 ME/kg; fat, 5%; crude fiber, 2%; calcium,5.6ppm; available phosphorus, 2.6 ppm; methionine 3.7%; lysine, 3.85; vit E, 600 mg; with NRC (1994) specification; [4]Vitamin premix Produced by factories veterinary medicines and agricultural (VAPCO) Jordanian and carry the brand name VAPCOMIX a range of vitamins and minerals as well as vitamin and methionine, which let meet the needs of the bird; [5]Calculated composition was according to NRC (1994) ; Kratzer and Pran Vohra (1996); Lesson and summers (1997).

Table 2: Serum biochemical indices in broiler males and females fed diets containing different levels of flaxseed powder

Parameter	T1 (0%)		T2 (12%)		T3 (14%)		T4 (16%)		SEM	
	M	F	M	F	M	F	M	F	M	F
Serum protein (g/dl)	4.46^{a}	4.07^{a}	3.98^{ab}	3.81^{ab}	4.03^{a}	3.58^{ab}	3.37^{b}	3.37^{b}	0.18^{*}	0.20
Albumin (g/dl)	2.82^{a}	2.54^{a}	2.43^{b}	2.54^{a}	2.40^{b}	2.23^{b}	2.24^{b}	2.41^{b}	0.08^{**}	0.07^{**}
Globulin (g/dl)	1.63	1.53	1.54	1.27	1.62	1.34	1.13	1.28	0.13	0.14
Total albumin (g/dl)	63.51	62.60	61.46	66.82	59.69	62.65	66.50	66.19	2.16	1.95
Total globulin (g/dl)	36.48	37.39	38.53	33.17	46.96	37.33	33.48	33.79	3.61	1.95

[a,b]Means in the same row bearing different superscripts differ significantly (P<0.01); M: male, F: female; NS =Non significant; **= Significant (0.01) SEM = Standard error of means

Table 3: Serum biochemical indices in broiler males and females fed diets containing different levels of flaxseed powder

Parameter	T1 (0%)		T2 (12%)		T3 (14%)		T4 (16%)		SEM	
	M	F	M	F	M	F	M	F	M	F
ALT (U/l)	20.89	21.29	20.14	20.65	19.90	21.32	20.89	20.14	0.56	0.64
AST (U/l)	28.43^{b}	31.40^{b}	21.38^{b}	26.23^{b}	27.89^{b}	37.12^{ab}	44.18^{a}	43.38^{a}	1.39 **	1.28**
ALP (U/l)	28.23^{b}	27.37^{b}	34.17^{b}	34.80^{b}	30.74^{b}	35.97^{b}	43.53^{a}	41.33^{a}	3.83**	2.39**

^{a,b}Means in the same row bearing different superscripts differ significantly (P<0.01); M: male, F: female; ALT; Alanine amino transferase enzyme, AST; Aspartate amino transferase enzyme, ALP: alkaline phosphatase enzyme; NS =Non significant; **= Significant (0.01) SEM = Standard error of means.

globulin have been presented in Table 2.The result showed that serum protein decreased significantly (P<0.05) in male and female broiler fed with 16% flaxseeds. Similarly, albumin also decreased significantly (P<0.01) in male and female broiler fed with 16% flaxseed. The rest of the parameters did not differ significantly between the control and experimental groups. The result of ALT, AST, ALT, Ca and P are given in Table 3. The results showed that AST and ALP increased significantly (P<0.01) in male and female broiler fed with the highest level of flaxseed (16%). All other parameters remained unchanged (P>0.05) between control and experimental groups.

Discussion

Results reported in the present study showed significant differences in some of the qualitative parameters of the blood, which is conforming with the study of Al-Azzawi et al. (2011) who reported that use of flaxseed powder in the diets of broiler chickens led to a reduction in the percentage of total protein in the blood which is attributed to a reduction in the rate of amino acids. They further commented that because of the anti food Linatin in flaxseed, which reduces the availability and absorption of vitamin B6 that is required in the formation of protein in the body through the removal of the carboxyl groups of amino acids and transfer to amines, which in turn is reflected in the concentration of a protein in the blood, thus reduces the rate of protein synthesis in the body. This result is in agreement with the findings of the Al-Asady (2013) who used flaxseed powder in the diets of broiler chickens with high levels led to a reduction in body weight, which has a direct correlation with the proportion of protein in the blood. Al-Darraji et al. (2008) showed that the reduced ratio of blood protein has a relationship in the health status of the birds or hepatic diseases or malnutrition or malabsorption. Klosterman et al. (1967) reported that the presence of Linatine in flaxseed, one of the gums plant, works to reduce the growth rates of the animal through reduction of the level of enzymes from the pancreas, leading to a reduction in the digestion of food, or may be due to the presence of polysaccharides of non-starchy in the gums present in flaxseed, which works to increase the viscosity of the intestines and reduces the availability of food (Classen and Bedford, 1991). Al-Darraji et al. (2008) reported that decline in the proportion of albumin in the blood (hypoalbuminemia) is usually linked closely to the proportion of total protein it represents.

The increased liver enzymes concentration in the present study under high dose of flaxseed may be due to hydrogen cyanide present in flaxseed, which leads to the accumulation of these toxins in the liver and causes toxicity of liver (Mazza and Oomah, 1995; Shen et al., 2005) resulting in the increased secretion of liver enzymes.

It was concluded that high dose of golden flaxseed (*Linum usitatissimum* L.) powder as a fed additive in diets reduces some blood biochemical in male and female broiler chicks.

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