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Effect of Canola Oil on the Iranian Native Turkeys Bone Mineralization (Meleagris Gallopavo)

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Abstracts: The purpose of this study was to investigate the effects of varying levels of canola oil in the diets of Iranian native turkeys on tibia bone characteristics. A total of 90 one day old chicks randomly divided into three experimental treatments with three replicates were arranged in a completely randomized design. The experimental period lasted 20week. Experimental diets consisted of: Basal diet with 0, 2.5 and 5 percent of canola oil. Results showed that increase of canola oil affected tibia bone mineralization and significantly increased calcium content in the experimental treatments, but has not affect on the phosphors content.

Key words: Iranian native turkey · Canola oil · Tibia bone · Calcium · Phosphors

INTRODUCTION

Calcium and phosphorous are couple of essential inorganic materials which are involved in many physiological functions of the body of living animals [1,2]. Leg weakness in turkeys was reported to be a significant economic problem for the turkey industry and Increased leg bone strength could help to breeding turkey specially in heavy weight and male turkeys [3,4]. The role of lipids in bone metabolism and skeletal health is well documented. It has been shown that acidic phospholipids facilitate cartilage mineralization in the growth plate [5] and prostaglandins mediate messages from biomechanical forces [6] which aid in regulating anabolic factors, including insulin-like growth factors [7]. Recently studies indicated that the dietary intake of certain fatty acids may help to conserve bone mineral density. Consumption of n-3 fatty acids is associated with reduced incidence and severity of inflammatory bone and joint problems [8]. Vegetable sources, such as canola oil (CO) and linseed oil may clearly increase the n-3 fatty acids content in the form of linolenic acid (LNA), the precursor of the whole n-3 family. Therefore, the specific aims of this research were to evaluate the effect of feeding diets of varying percent of canola oil on the bone calcium and phosphors of Iranian native turkey. In east Azarbaijan Research Center for Agriculture and Natural Resources (Tatar Research Station) recently native turkeys of Azerbaijan collected and with some of genetically methods could improve that's genetically potential and compared with native turkeys in native environment have significantly higher performance, therefore increase mineralization of calcium and phosphors could beneficial effect on the bone. Objective of this research was to evaluate the effect of canola oil as a source n-3 fatty acid and its effects on the tibia calcium and phosphors contents.

MATERIALS AND METHODS

Animals and Diets: The investigation was performed on 90 male native Iranian turkeys in their fattening period (from 4th to 20th week of age). The turkey chicks with completely randomized design of 3 treatments, with 3 repetitions and 10 chicks in each box were fed experimental diets containing 0% CO, 2.5% CO and 5%CO in the fattening period. The experimental diets formulated isonitrogenouse and isoenergetic, accordance with the 1994 recommendations of the National Research Council (Table 1). The birds were given access to water and diets ad-libitum. The composition and calculated nutrient composition of the treatment diet is shown in table 1.

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Table 1: Percentage Composition of Experimental Diets in Four Period

	4 -8 week			8 - 12 week			12 - 16 week			16 - 20 week		
Ingredients'	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Corn	42.50	38.00	36.00	45.60	43.00	35.00	56.64	48.50	40.00	64.41	58.00	48.00
SBM	34.40	36.00	31.15	28.25	27.30	28.24	26.00	27.00	27.50	21.00	21.00	21.00
Oi	0.00	1.25	2.50	0.00	2.50	5.00	0.00	2.50	5.00	0.00	2.50	5.00
Fish	4.80	3.70	6.60	8.00	8.00	8.00	2.64	1.82	1.50	0.65	0.70	0.67
Starch	3.10	3.22	1.56	7.46	3.32	3.37	6.57	6.51	6.50	7.10	5.56	6.71
Alfalfa	3.47	5.00	6.00	3.00	5.00	6.00	1.50	4.00	6.00	1.00	3.80	6.00
DCP	1.38	1.52	1.11	0.63	0.61	0.62	1.03	1.15	1.18	1.17	1.15	1.15
Met	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Lys	1.50	1.50	1.50	1.50	1.50	1.50	1.40	1.50	1.50	1.50	1.50	1.50
Oyster	1.02	1.02	0.86	0.73	0.67	0.62	0.92	0.87	0.82	0.90	0.81	0.73
wheat bran	2.00	3.00	6.00	2.50	5.00	6.00	1.00	3.00	6.00	0.00	1.70	5.00
Vit supp[1]	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Min supp[2]	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Sand	3.58	3.54	4.47	0.08	0.85	3.40	0.05	0.90	1.75	0.02	1.03	1.99
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated nutrient content												
ME kcal/kg	2755	2755	2755	2850	2850	2850	2945	2945	2945	3040	3040	3040
Crude protein (%)	24.7	24.7	24.7	20.9	20.9	20.9	18.1	18.2	18.1	15.7	15.7	15.7
Calcium (%)	0.95	0.95	0.95	0.81	0.81	0.81	0.71	0.71	0.71	0.62	0.62	0.62
Available P (%)	0.48	0.48	0.48	0.40	0.40	0.40	0.36	0.36	0.36	0.31	0.31	0.31
ME/CP	112	112	112	136	136	136	163	162	163	194	194	194
Ca/P	2	2	2	2	2	2	2	2	2	2	2	2

1Vitamin content of diets provided per kilogram of diet: vitamin A,D, E and K.

2 Composition of mineral premix provided as follows per kilogram of premix: Mn, 120,000mg; Zn, 80,000 mg; Fe, 90,000 mg; Cu, 15,000 mg; I, 1,600 mg; Se, 500 mg; Co, 600 mg

At the end of the growing period the number of two pieces from each pen randomly selected and slaughtered with cutting the neck vessels and experimental samples from each replication of treatment and tibia keep at temperature - 20°C below zero were stored until start laboratory works.

Ash Content: Left tibias of treatments were used to test the boiling/extraction method [9]. Tibias were boiled for 5 min to loosen muscle tissue. Using scissors, forceps and scalpel meat, connective tissue and the fibula bone were completely removed, leaving the complete tibiotarsus with external cnemial crest, lateral condyle of tibia [10]. As the bones were cleaned they were put into a container of ethanol and soaked overnight before being extracted with ethanol, (removing water and polar lipids). Bones were then further extracted in anhydrous ether for 24 h (removing non polar lipids). After the second extraction, bones were dried at room temperature for 24 h and tibia samples were oven-dried at 105°C for 24 h for dry matter determining. Samples were then weighed, ashed in a muffle furnace overnight at 600°C and weighed again after ashing.

Calcium and Phosphor Determine: The calcium content was measured by atomic absorptionand phosphors with spectrophotometer methods.

Statistical Analysis: Data were analyzed by using GLM ANOVA (SAS version 9.1, SAS Institute) [11]. Significant differences of means between treatments were tested by using the Duncan test at the 5% probability level. Variation within each treatment was expressed as the SEM.

Table 2: Least square means of tibia minerals of turkeys fed different level of canola oil

	Control	2 percent	4 percent	SEM	P value
DM	55.58[a]	56.695[a]	57.297[a]	1.8184	0.0786
Ash	34.56[b]	36.089[a]	35.648[a]	3.4528	0.5016
Calcium	27.71[b]	28.73[a]	29.045[a]	2.0317	0.04717
Phosphors	17.79[a]	17.398[a]	17.177[a]	1.95224	0.0687

RESULTS AND DISCUSSION

Calcium, phosphorus, dry matter and ash contents of the tibia of Iranian native turkeys fed different diets after 20 week of age are presented in table 2.Usage canola oil could not affected dry matter percent and dry matter content of tibia bone is range of 55-57 percent, but ash content significantly changed related with different levels of canola oil and its effects may be had correlation with omega3 fatty acids in diet. Ash percent of control group is 34.56 percents and with ascending rate reached to 36.086 and 35.648 percent respectively in experimental treatments. Calcium content were affected with experimental diets and significantly increased with usage of canola oil and had direct relation with canola oil level and from 27.71 percent in control group reached to 28.73 and 29.045 percent in treatment with 2.5 and 5 percents canola oil, but phosphors level not changed and canola oil could not change its content and that's content is rang of 17 percent. Several animal studies have shown a positive effect of n-3 on bone mineral density and bone mineral content. Recently found significantly higher bone mineral density in quail fed a fish oil-supplemented diet (high in n-3) compared with a soybean oil diet group (high in n-6) [16]. Similarly, fish oil-supplemented rats had significantly higher bone mineral density in the distal femur and proximal tibia than a corn oil-supplemented group (high n-6) [12, 13]. However, other studies have shown no significant effect of a high n-3 diet on bone mineral density [14, 15]. Essential fatty acids may also modulate bone strength. Demonstrated that long-term supplementation of n-3 fatty acids was beneficial to biomechanical properties. In quail fed fish oil, compared with chicken fat and soybean oil, bone shear force and shear stress were increased [16]. n-3-deficient in rats, which had significantly lower peak force compared with n-3-adequate controls [17]. The mechanisms that underlie the effects of these essential fatty acids may be attributed to their ability to increase calcium absorption from the gut, to improve bone formation and bone strength by increasing calcium deposition in bone and to enhance the synthesis of bone collagen and to reduce bone resorption by lowering urinary excretion of calcium [16, 17]. However, result show that oil with n-3 fatty acids could had good and beneficial effects on the turkey's tibia bone mineralization and this status help to tibia to support body weight.

CONCLUSION

It was concluded the application of canola oil or source of omega 3 fatty acid could significantly affected bone mineralization and calcium content in bone, this results as the animal model could usage in human health.

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