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Beneficial Effects of Canola Oil on Serum Biochemical Parameters of Iranian Native Turkeys

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Abstract: During many years, the main objective of the poultry meat industry was to improve body weight and feed efficiency of the birds. However, in the modern poultry industry, there are other parameters that need to be taken into consideration such as low cholesterol, etc. deposition on the body. For this aim, an experiment was conducted to evaluation canola oil effects on the Iranian native Turkeys serum lipids and cholesterol. Ninety male Turkey chicks were randomly distributed into 3 experimental with three replicate for each groups. Diets were isonitrogenous and isoenergetic were given to Turkey chicks throughout four period of breeding (4th-8th, 8th-12th, 12th-16th and 16th-20th). The blood sample taken at the end of breeding period and serum values for triglycerides and total, High-Density-Lipoprotein (HDL) and LDL (calculated by Friedewald method). Data was analyzed with One Way (ANOVA) and means compared with Duncan test. For serum values were not found significantly different ($p<0.05$) in triglycerides and VLDL and in CHOL, LDL and HDL ($p<0.05$) were significantly different compared control group. Finally, our results shown that canola oil has a significant impact on lipid metabolism in native Turkey and could improve their serum lipid profile.

Key words: Canola oil, cholesterol, triglyceride, HDL, LDL, Turkey

INTRODUCTION

Turkeys have been raised on the world to produce meat and their meat production currently developed in Iran. Oils have commonly been used as energy sources in the diets of Turkey. Thus, alter the biochemical parameter such as cholesterol, triglyceride and LDL and HDL very important to human health. Canola Oil (CO) has been recognized as rich plant source of Ω-3 fatty acids and medical research reported a diet abundant in Ω-3 fatty acids in beneficial for human health and has shown that some plant oil such as canola oil could alter some of serum biochemical parameters and transfer from animal feed into consumer products.

Cholesterol in the bloodstream is most important (Howard *et al*., 2006). Grundy (1980) found that dietary mono-unsaturated fatty acids (e.g., oleic) were very effective in lowering blood cholesterol concentration and may be important in preventing coronary heart disease. Poultry spices, age and breeding condition are known to affect cholesterol deposition (Hargis, 1988; Halle, 1996, 2001).

The objective of this research was to determine the effect of feeding canola oil on cholesterol and triglyceride, LDL and HDL content of male Iranian native Turkeys.

MATERIALS AND METHODS

Animal and diet: The investigation was performed on 90 male native Iranian Turkeys in their fattening period (from 4-20th week of age). The Turkey chicks with completely randomized design of 3 treatments, with 3 repetitions and 10 broiler chicks in each box were fed experimental diets containing 0% CO (T_1), 2.5% CO (T_2) and 5% CO (T_3) in fattening period. The experimental diets formulated isonitrogenouse and isoenergetic, accordance with the 1994 recommendations of the National Research Council (NRC).

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. Four birds from each replicate were taken blood and after separate serum, translated to lab for analyses a cholesterol and triglyceride content.

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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'	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3
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
Oil	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
Total	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^{-1})	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

[1]Vitamin 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, 120,000 mg; Zn, 80,000 mg; Fe, 90,000 mg; Cu, 15,000 mg; I, 1,600 mg; Se, 500 mg; Co, 600 mg

Biochemical serum analysis: Total serum cholesterol, triglycerides and high density lipoprotein cholesterol were assayed using a commercial kit supplied by (Pars azmoon Co., Ltd.) and detected by (Alison, 300) autoanalyser system. Very low density lipoprotein cholesterol is estimated as (Triglycerides/5) (Friedewald *et al*., 1972). Low density lipoprotein cholesterol is estimated using the Friedewald equation (Low density lipoprotein cholesterol = Total cholesterol - (High density lipoprotein cholesterol-Trigylerides/5) (Friedewald *et al*., 1972).

Statistical analyses: Data were analyzed in a complete randomized design using the GLM procedure of SAS (2000) version 12 (SAS Inst. Inc., Cary, NC).

$$y_{ij} = \mu + a_i + \varepsilon_{ij}$$

Where:

y_{ij} = All dependent variable
μ = Overall mean
a_i = The fixed effect of oil levels (i = 1, 2, 3)
ε_{ij} = The random effect of residual. Duncan multiple range tests used to compare means.

RESULTS AND DISCUSSION

The effect of canola oil on biochemical serum levels was shown in (Table 2). According to results were none significantly different on triglycerides and VLDL content in serum, while total cholesterol, HDL and LDL were significantly affected with dietary manipulation ($p>0.05$). Cholesterol content has descending rate and affected canola oil and from 148.83 mg dL^{-1} in control group (T_1) significantly reached to 114.0 mg dL^{-1} in T_3 group, but compared with T_2 (126.67 mg dL^{-1}) hasn't significantly different. High density lipoprotein and very low density lipoprotein positively affected with CO and HDL content significantly increase in treatment contain with 5% CO (61.00 mg dL^{-1}) compared control group and for LDL results show that treatment with CO (T_2 and T_3) have lower content of LDL and significantly deferent compared with control group($p>0.05$).

Table 2: Least square means for serum biochemical parameter

Parameters	Treatments				
(mg dL^{-1})	T_1	T_2	T_3	SEM	p-value
TAG[1]	77.75	76.660	79.50	10.7690	0.9586
CHOL[2]	148.83[a]	126.670[ab]	114.00[b]	14.3940	0.0264
VLDL[3]	15.55	15.332	15.90	1.8987	0.9682
HDL[4]	41.41[b]	48.330[ab]	61.00[a]	7.1890	0.0127
LDL[5]	91.87[a]	63.000[b]	57.10[c]	13.6190	0.0003

[1]Triglycerides; [2]Total cholesterol; [3]Very low density lipoprotein cholesterol; [4]High density lipoprotein cholesterol; [5]Low density lipoprotein cholesterol. Values in the same row with no common superscript are significantly different

The present findings showed that substitution canola oil in dietary reduced the serum cholesterol concentration by 5%, whereas an addition of 2.5% decreased serum

cholesterol, but not significant. Canola contains 65-75% monoenic fatty acids and 9-30% polyunsaturated fatty acids (Ackman, 1990). Monounsaturated fat has also been shown to lower cholesterol (Grundy, 1980; Mensink and Katan, 1989; Fouladi *et al*., 2008). Canola oil is an excellent source of monounsaturated fat, contains intermediate amounts of the precursor Ω-6 and Ω-3 polyunsaturated fatty acids Linoleic Acid (LA) and Alfa-Linoleic Acid (ALA), respectively and is very low saturated fat.

Canola oil as a source of phytosterols. Phytosterols (plant sterols) are structural analogs of the cholesterol found in animals and humans. The consumption of phytosterols has been shown in numerous studies to lower blood cholesterol levels and may therefore, help reduce the risk of cardiovascular disease (Ling and Jones, 1995). Unsaturated oil could decrease amount of harmful Low-Density Lipoprotein (LDL) cholesterol in the serum (Mensink and Katan, 1989; Judd *et al*., 1994; Katan *et al*., 1995; Ascherio and Willett, 1997). Studies have shown that consumption of monoenic fatty acids effectively lowers serum cholesterol concentrations (Mattson and Grundy, 1985; Sirtoni *et al*., 1986; Mensink and Katan, 1989; Dreon *et al*., 1990; Valsta *et al*., 1992; Grundy *et al*., 1988). The reduction of serum cholesterol by monoene-nich rapeseed oil agrees with earlier observations with monounsaturated fatty acids (Mattson and Grundy, 1985; Sirtoni *et al*., 1986; Mensink and Katan, 1989; Dreon *et al*., 1990; Valsta *et al*., 1992).

CONCLUSION

Finally, our results illustrated that canola oil has a significant impact on lipid metabolism in native Turkey and could improve there serum lipid profile.

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REFERENCES

Ackman, R.G., 1990. Canola fatty acids-an ideal mixture for health, nutnition and food use. Canola and Rapeseed, 2: 81-98.

Ascherio, A. and W.C. Willett, 1997. Health effects of trans fatty acids. Am. J. Clin. Nutr., 66: 1006-1010.

Dreon, D.M., K.M. Vranizan, R.M. Knauss, M.A. Austin and P.D. Wood, 1990. The effects of polyunsaturated fat vs monounsatunated fat on plasma lipoproteins. JAMA, 263: 2462-246.

Fouladi, P., R. Salamatdoust and A. Ahmadzadeh, 2008. Effect of canola oil on liver and blood cholesterol and triglyceride contents in broiler chocks. Res. J. Poult. Sci., 2 (3): 63-66.

Friedewald, W.T, R.I. Levy and D.S. Fredrickson, 1972. Estimation of the concentration of low-density lipoprotein cholesterol without the use of the preparative ultracentrifuge. Clin. Chem., 18: 499-502.

Grundy, S.M., L. Florentin, D. Nix and M.F. Whelan, 1988. Comparison of monounsaturated fatty acids and carbohydrates for reducing raised levels of plasma cholesterol in man. Am. J. Clin. Nutr., 47: 965-969.

Grundy, S.M., 1980. Comparison of mono-unsaturated fatty acids and carbohydrates for lowering plasma cholesterol. New England J. Med., 314: 745-748.

Halle, I., 1996. Effect of dietary fat on performance and fatty acid composition of egg yolk in laying hens. Arc. Fur. Gef., 60: 65-72.

Halle, I., 2001. Effect of dietary fish oil and linseed oil on performance, egg component and fatty acid composition of egg yolk in laying hens. Arch. Fur. Gef., 65: 13-21.

Hargis, P.S., 1988. Modifying egg yolk cholesterol in domestic fowl: A review. World's Poult. Sci. J., 44: 17-29.

Howard, B.V., L. Van Horn and J. Hsia, 2006. Low-fat dietary pattern and risk of cardiovascular disease: The Women's Health Initiative Randomized Controlled Dietary Modification Trial. JAMA, 295: 655-666.

Judd, J.T., B.A. Clevidence, R.A. Muesing, J. Wittes, M.E. Sunkin and J.J. Podczasy, 1994. Dietary trans fatty acids: Effects of plasma lipids and lipoproteins on healthy men and women. Am. J. Clin. Nutr., 59: 861-868.

Katan, M.B., P.L. Zock and R.P. Mensink, 1995. Trans fatty acids and their effects on lipoproteins in humans. Annu. Rev. Nutr., 15: 473-493.

Ling, W.H. and P.J. Jones, 1995. Dietry Phytosterols: A rivew of metabolism, benefits and side effects. Life Sci., 57: 195-206.

Mattson, F.H. and S.M. Grundy, 1985. Comparison of effects of dietary saturated, monounsaturated and polyunsaturated fatty acids on plasma lipids and lipoproteins in man. J. Lipid Res., 26: 194-202.

Mensink, R.P. and M.B. Katan, 1989. Effects of a diet enriched with monounsaturated or polyunsaturated fatty acids on levels of a low-density and high-density lipoprotein cholesterol in healthy women and men. N. Engl. J. Med., 321: 436-441.

SAS Institute, 2000. SAS Institute Inc., Cary, NC.

Sirtoni, C.R., E. Tremoli and E. Gatti, 1986. Controlled evaluation of fat intake in the Mediterranean diet: Comparative activities of olive oil and corn oil on plasma lipids and platelets in high-risk patients. Am. J. Clin. Nutr., 44: 635-642.

Valsta, L.M., M. Jauhiainen, A. Aro, M.B. Katan and M. Mutanen, 1992. Effects of a monounsatunated rapeseed oil and a polyunsaturated sunflower oil diet on lipoprotein levels in humans. Arterioscler Thromb., 12: 2-7.