Short Communications

EFFECT OF DIETARY SUPPLEMENTATION OF GHEE RESIDUE ON SERUM BIOCHEMISTRY AND HAEMATOLOGY OF JAPANESE QUAILS

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Consumer preference towards diversified poultry meat is increasing steadily because of increased health consciousness of consumers. Among the diversified poultry, Japanese quails are the main contributors and its meat is a "gourmet's delight" due to its good quality animal protein. The ingredients like maize, soyabean meal, fish meal and vegetable oils constitutes a major source of energy, protein and fat in the poultry feed. Poultry farmers are facing deep crisis due to unprecedented increase in the price of these essential feed ingredients. Feed cost is the major expenditure involved in the poultry production and constitutes around 60-70% of the total cost, Hence, a judicious use of ingredients, utilizing industrial by-products/wastes to reduce the cost of production on one side and maximizing the nutrient utilization in poultry on the other side is the need of the hour. Ghee residue, a charred light to dark brown residue is the by-product of ghee industry and, it is a rich source of energy, protein, fat and minerals. This could be effectively utilized as an unconventional feedstuff in poultry ration (Arumugam *et al*., 1989). The ether extract content of ghee residue is highly variable (Varma and Narender Raju, 2008), who recorded a wide variation (33.40-80.80 %) in ether extract content of ghee residue obtained from different sources. The effect of higher fat content of ghee residue on Japanese quail serum biochemical profile and haematology is not known. Hence, this study was undertaken to present the effect of inclusion of ghee residue on serum biochemical profile and haematological parameters of Japanese quails.

The experiment was conducted in Japanese quail for the period of 0-5 weeks of age. Five hundred numbers of day old, unsexed Japanese quails belonging to a single hatch were utilized for this experiment. The experimental birds were randomly distributed into four treatment groups with five replicates each containing twenty five Japanese quails.

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Ghee residue was procured from a private dairy plant situated at Erode district of Tamilnadu and analysed for its nutritive value. Experimental rations were formulated based on the nutrient requirements provided for Namakkal Japanese quail by the Department of Poultry Science, Namakkal, Tamil Nadu on iso-caloric and iso-nitrogenous basis by including ghee residue at 0 (T_1), 5(T_2), 10(T_3) and 15(T_4) per cent levels. The experimental ration was fed to brooder for 0-3 and grower for 4-5 weeks of age. The experimental birds were reared in flat decked cages, fed with *ad -libitum* feed and water, providing good ventilation and reared under standard managemental conditions throughout the experiment.

At the end of 35 days of age, slaughter study was conducted as per the procedure described by (Genchev A., and R. Mihaylova, 2008). One hundred and twenty Japanese quails were randomly chosen for this study @ 30 (15 male and 15 female) per treatment. Blood was collected randomly from four birds per replicate in vaccutainers. A drop of blood was kept over a slide to prepare a smear for subsequent blood cells count using Leishman-geimsa stain method (Bancroft and Marilyn, 2008). The collected blood was kept in slanting position and left undisturbed for few hours and centrifuged at 2000 rpm for 10 minutes to separate the serum.

Parameters such as total protein, albumen, glucose, calcium, phosphorus, magnessium, total cholesterol, triglycerides, HDL and LDL levels were analysed by using AGAPPE diagnostic kits. The LDL level was calculated by Friedwal equation. The collected data were statistically analysed using one-way ANOVA under completely randomized design in Software Package for Social Sciences (SPSS) version. 20.0 and significance was tested using Duncan multiple range test (Duncan, 1955).

The study revealed highly significant ($P \leq 0.01$) differences among the treatment groups in serum biochemical parameters (Table 1).There is no published literature available on the effect of ghee residue (GR) on serum biochemical parameters and haematology of Japanese quail for comparison and this study presents the premier report. The total protein level revealed a highly significant ($P<0.01$) difference in favour of T_1 (3.95 g/dl) followed by T_2 (3.30 g/dl) and T_4 (2.60 g/dl). Albumin level was significant ($P<0.05$) among the treatment groups, where the highest level was observed in T_1 (1.35 g/dl), lowest level was observed in both T_3 and T_4 (1.05 g/dl). Calcium and phosphorus levels were highly significant ($P<0.01$) among the treatment groups, where the highest levels of calcium and phosphorus levels were observed in T_1 (14.60 mg/dl and 17.15 mg/dl) and lowest level for calcium was observed in T_3 (10.75 mg/dl) and for phosphorus it was in T_4 (11.15 mg/dl). This might be due to higher free fatty acids in the diet which might react with calcium and phosphorus forming insoluble soaps which prevents its absorption (Gacs and Barltrop, 1977). Triglyceride levels were highly significant ($P \leq 0.01$) among the treatment groups and it was highest in T_1 (168.15 mg/dl) and lowest in T_3 (72.70 mg/dl). LDL levels were highly significant ($P<0.01$) among the treatment groups and it was highest in T_1 (86.85 mg/

dl) and lowest in T_4 (31.85 mg/dl). Khogare (2012) inferred a decrease in LDL levels after supplementing a high dietary fibre.

The decreasing trend of parameters like total protein, albumin, calcium, phosphorus, triglycerides and LDL levels might be due to increased level of crude fibre in the respective ration as the level of inclusion of De-oiled Rice Bran (DORB) in experimental rations become inevitable as the inclusion levels of GR increased. Dietary fiber has an abrasive effect on the intestinal wall and may result in increase in endogenous cell losses and nutrients may enter in to the lumen, so the availability of nutrients is reduced and this is supported by Mateos *et al.* (2012). Similar finding was reported by Loganathan *et al.* (2014) who noticed decreased serum LDL, total protein and triglyceride levels with increase in the level of inclusion of GR in broilers. The levels of total cholesterol and HDL were not influenced by feeding ghee residue at graded levels in Japanese quail ration. Anitha *et al.* (2008) reported that there was no effect on serum triglyceride, HDL, LDL and total cholesterol levels after supplementing a diet containing crude rice bran oil in broilers. The reason for this difference might be due to differences in the fatty acid composition of oil and GR. The gradual increase in the crude fibre content of experimental ration might also influence the triglycerides and LDL levels of serum in Japanese quails. The result on serum glucose level was highly significant ($P<0.01$) between the treatment groups, where the highest level was observed in T_4 (275.95 mg/dl) and lowest level in T_1 (172.45 mg/dl). The increasing trend of glucose might be due to lactose content of ghee residue in the respective rations and this is supported by Gentao *et al.* (2003) who reported that the presence of higher lactose level in the diet will reduce the insulin level by increasing the insulin to glucose ratio in serum. The results on magnesium level was highly significant ($P<0.01$) between the treatment groups, where highest level of magnesium was observed in T_3 (8.70 mg/dl) and lowest level was observed in T_1 (7.25 mg/dl). The reason for gradual increase in the levels of magnesium might be due to calcium and magnesium antagonistic effect and this is supported by Fawcett *et al.* (1999). The results on serum biochemical parameters clearly evidenced that increasing the level of ghee residue would decrease the serum parameters like total protein, albumen, calcium, phosphorus, triglycerides and LDL levels except glucose and magnesium. The results on haematological parameters like RBC, WBC and Differential count (DC) was not significant among the treatment groups, which indicated that increasing the level of ghee residue even up to 15 per cent have not influenced the haematological parameters in Japanese quails and this was supported by Selvamani (2015) who reported a similar finding in swine fed with graded levels of ghee residue.

REFERENCES

Anitha B., M. Moorthy And K. Viswanathan, Crude Rice Bran Oil In Broiler Diet, 2009. *Tamilnadu Journal of Veterinary & Animal Sciences., 5 (3): 120-121.*

Arumugam, M.P., K. Vedhanayaga, K.A. Doraisamy and D. Narahari, 1989. Chemical composition and nutritive value of ghee residue for chickens.

Animal Feed Science and Technology., 26: 119-128.

Bancroft, J.D and G.Marilyn. 2008. Theory and practice of histological techniques. Sixth edition.

Duncan, D.B., 1955. Multiple range and multiple F test. Biometrics, 11:1-42.

Fawcett W.J., E.J. Haxby and D.A. Male, 1999. Magnesium: Physiology and pharmacology. *British Journal of Anaesthesia.,* 83: 302-20.

Gacs G. and D. Barltrop., 1977. Significance of Ca-soap formation for calcium absorption in the rat. *Gut.,* 18: 64-68.

Genchev A., and R. Mihaylova, 2008. Slaughter analysis protocol in experiments using Japanese quails. *Trakia Journal of Science.,* (6) 4: 66-71.

Gentao Liu., Claude L. Hughes., Ruchi Mathur., Warren G. Foster., Vicki L.Davis., Denis A. Magoffin, 2003. Metabolic effects of dietary lactose in adult female rats. *Reproductive Nutriton Devision*., 43: 567–576.

Khogare, D.T., 2012. Effect of dietary fiber on blood lipid profile of selected respondent. *International Food Research journal.,* 19(1): 297-302.

Loganathan, R., P. Shamsudeen, K. Mani, S.C. Edwin, R. Amudha and K.Rajendran, 2014.Effect of Dietary Ghee Residue on Serum Biochemistry and Meat Cholesterol in Broiler Chicken. *Indian Veterinary Journal.,* 98 (8): 09-11.

Mateos, G. G., E. Jimenez-Moreno , M. P. Serrano , and R. P. Lazaro, 2012. Poultry response to high levels of dietary fiber sources varying in physical and chemical characteristics. *Journal of applied poultry Research*. 21:156–174.

Selvamani, J.,2015. Effect of inclusion of ghee residue as a feed ingredient in concentrate diets of Large White Yorkshire Pigs. M.V.Sc., thesis submitted to Tamil Nadu Veterinary and Animal Sciences University, Chennai 51.

Varma, B.B. and P. Narender Raju, 2008. Ghee residue: Processing, properties and utilization. In course compendium on "Technological advances in the utilization of dairy by-products". Centre of Advanced Studies in Dairy Technology, NDRI, Karnal. p: 176-183.

TABLE 1. Serum biochemical parameters of Japanese quail fed with graded levels of ghee residue (Mean ± SE)

Serological parameters	Inclusion of ghee residue at graded levels in feed				
	T_1 (0%GR)	T_2 (5%GR)	T_3 (10%GR)	T_4 (15% GR)	P value
Total protein**(g/dl)	3.95^{a}±0.21	3.30^{b}±0.19	3.05^{bc}±0.15	2.60^{c}±0.15	0.000
Albumin* (g/dl)	1.35^{a}±0.11	1.15^{ab}±0.08	1.05^{b}±0.05	1.05^{b}±0.05	0.023
Glucose**(mg/dl)	172.45^{c}±6.41	219.00^{b}±9.69	240.45^{b}±10.08	275.95^{a}±11.23	0.000
Calcium**(mg/dl)	14.60^{a}±0.76	11.85^{b}±0.86	10.75^{b}±0.39	12.40^{b}±0.39	0.001
Phosphorus**(mg/dl)	17.15^{a}±0.86	11.40^{b}±0.61	11.35^{b}±0.67	11.15^{b}±0.70	0.000
Magnesium**(mg/dl)	7.25^{b}±0.26	8.35^{a}±0.13	8.70^{a}±0.11	8.50^{a}±0.11	0.000
Triglycerides**(mg/dl)	168.15^{a}±36.44	96.11^{b}±11.92	72.70^{b}±5.52	78.60^{b}±13.32	0.005
Totalcholesterol^{NS}(mg/dl)	248.70±10.83	267.20±8.85	245.60±10.59	230.80±8.77	0.081
HDL^{NS}(mg/dl)	104.70±6.21	109.50±6.44	94.05±6.44	90.80±5.19	0.110
LDL**(mg/dl)	86.85^{a}±9.05	35.85^{b}±3.58	36.50^{b}±3.97	31.85^{b}±2.66	0.000

Mean of twenty samples.

Mean values bearing same superscript within rows did not differ significantly.

^{NS}-Non significant; **-Highly significant (P≤0.01); *-Significant (P<0.05).

TABLE 2. Haematological parameters of Japanese quail fed with graded levels of ghee residue (Mean ± SE)

Haematological parameters	Inclusion of ghee residue at graded levels in feed				
	T_1 (0%GR)	T_2 (5%GR)	T_3 (10%GR)	T_4 (15% GR)	P value
RBC^{NS} ($x10^{6}$)	2.31±0.10	2.37±0.22	2.24±0.19	2.32±0.08	0.954
WBC^{NS} ($x10^{3}$)	23.63±1.68	22.75±2.26	24.50±2.47	22.75±2.26	0.930
Differential Leukocyte Count^{NS} (%)					
Lymphocyte	44.50±0.65	46.25±0.85	43.00±0.82	45.00±1.22	0.143
Monocyte	1.50±0.29	1.25±0.25	1.50±0.29	1.50±0.29	0.894
Basophils	7.75±0.85	8.25±1.11	9.00±0.71	8.25±0.63	0.775
Eosinophils	8.25±0.48	8.25±0.63	8.75±0.75	9.00±0.91	0.840
Heterophils	38.00±1.35	36.00±1.68	37.75±1.44	36.25±1.25	0.688

Mean of four samples.

^{NS}-Non significant.