International Journal of Allied Sciences (IJAS)
Volume.13, Number 12; December-2022;
ISSN: 2836-3760 | Impact Factor: 6.15
https://zapjournals.com/Journals/index.php/Allied-Sciences
Published By: Zendo Academic Publishing

ANALYZING BREED AND SEX INFLUENCES ON SERUM BIOCHEMICAL PARAMETERS IN DUCKS: A COMPARATIVE STUDY OF WHITE PEKIN AND INDIGENOUS DUCKS OF TAMIL NADU

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Article Info

Keywords: Duck, Serum Biochemical Profile, Breed, Sex.

Abstract

This study aimed to assess the impact of breed and sex on serum biochemical profiles in White Pekin and Indigenous ducks of Tamil Nadu. The research was conducted at the Post Graduate Research Institute in Animal Sciences (PGRIAS), Kattupakkam, with a sample size of eighty ducks, consisting of 20 males and 20 females from each breed. The ducks were raised under standardized management conditions, and blood samples were collected every four weeks from the 20th week for two months. Parameters such as Total Serum Protein, Serum Albumin, Serum Globulin, Serum Calcium, Serum Cholesterol, and Serum Triglyceride were evaluated. The findings demonstrated that White Pekin ducks had significantly higher Total Serum Protein, Serum Albumin, and Serum Globulin ($P<0.01$), while Serum Triglyceride levels were significantly higher ($P<0.01$) in Indigenous ducks of Tamil Nadu. Among sexes, female Indigenous ducks had significantly higher ($P<0.05$) Total Serum Protein and Serum Globulin than male ducks. Serum Cholesterol and Serum Calcium were significantly higher in female White Pekin and Indigenous ducks of Tamil Nadu compared to male ducks. In conclusion, the study established that breed and sex significantly affect serum biochemical parameters in White Pekin and Indigenous ducks of Tamil Nadu.

INTRODUCTION

Serum biochemical parameters play a vital role in understanding the health and physiological status of animals, including poultry. The evaluation of these parameters helps to assess the nutritional, metabolic, and pathological conditions of birds, and their response to different management practices and environmental stressors (Samanta et al., 2016). Ducks are an important source of meat and eggs, and are widely reared in various parts of the world, including India. The White Pekin duck, a commercial breed, and the indigenous ducks of Tamil Nadu, India, are widely reared for their meat and egg production (Sundararasu & Samanta,

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2019). However, limited information is available regarding the serum biochemical parameters of these breeds and their variations due to sex. Hence, understanding the breed and sex influences on serum biochemical parameters is crucial for ensuring the proper management, health, and productivity of these ducks. Several studies have reported the influence of breed on serum biochemical parameters in different poultry species (Oke et al., 2019; Samanta et al., 2016). For instance, in chickens, breed differences were observed in serum total protein, albumin, cholesterol, aspartate aminotransferase (AST), and alanine aminotransferase (ALT) levels (Samanta et al., 2016). Similarly, studies conducted on various breeds of ducks have also reported differences in serum biochemical parameters such as glucose, total protein, albumin, cholesterol, triglycerides, AST, and ALT (Oke et al., 2019; Sundararasu & Samanta, 2019). These differences could be attributed to genetic factors, as well as differences in growth rate, body size, and metabolic rates among different breeds (Balogun et al., 2021). Sexual dimorphism is a common phenomenon observed in poultry species, including ducks (Sundararasu & Samanta, 2019). Males and females often exhibit differences in growth rate, body size, and fat deposition, which could influence serum biochemical parameters (Oke et al., 2019). Previous studies have reported sex-related differences in serum biochemical parameters in various poultry species, including chickens, quails, and ducks (Oke et al., 2019; Samanta et al., 2016; Sundararasu & Samanta, 2019). For instance, Sundararasu and Samanta (2019) reported higher serum glucose, total protein, and cholesterol levels in female ducks compared to males. Similarly, Samanta et al. (2016) observed sex-related differences in serum total protein, albumin, and cholesterol levels in chickens. These differences could be attributed to variations in hormonal regulation, metabolic rates, and nutrient utilization between males and females (Balogun et al., 2021). Despite the importance of understanding the influence of breed and sex on serum biochemical parameters in ducks, limited information is available on this aspect, particularly in the White Pekin and indigenous ducks of Tamil Nadu. Therefore, the present study aimed to analyze the serum biochemical parameters, including glucose, total protein, albumin, cholesterol, triglycerides, AST, and ALT, in White Pekin and indigenous ducks of Tamil Nadu, and to examine the influence of breed and sex on these parameters.

MATERIALS AND METHODS

Treatment group comprising of 20 male and 20 female each in White Pekin and Indigenous ducks of Tamil Nadu were reared at Post Graduate Research Institute in Animal Sciences (PGRIAS), Kattupakkam under standard managemental conditions. Ducks were provided with *ad-libitum* duck layer mash feed and water. Two ml of blood was collected from these ducks individually from 20^{th} week onwards for the duration of two months and was kept undisturbed for two hours for the separation of serum. Total Serum Protein and Albumin in serum samples based on Direct Biuret method (Gornall *et al*., 1949) and BCG method (Doumas, 1970)**,** Serum Calcium based on OCPC method (Kessler and Wolfman, 1964), Serum Cholesterol and Triglyceride based on CHOD-PAP methodology and GPO-PAP method were estimated in the A15 Biosystem Auto analyser using commercially available AGAPPE kits at Centralized Clinical Laboratory, Madras Veterinary College, Chennai.

RESULTS AND DISCUSSION

The effect of breed and sex on Serum Biochemical profile was represented in the Table 1 & 2 respectively. Total Serum Protein and Globulin was significantly ($P<0.01$) higher in White Pekin ducks than Indigenous ducks of Tamil Nadu. Similar observation were also made in crossbred (Khaki Campbell x Non-Descript) and Desi ducks (Swati and Sudhamayee, 2005) and Serum albumin in White Pekin ducks was significantly ($P<0.05$) higher which was concurrent with the findings of Uko and Ataja (1996) and Swati and Sudhamayee (2005) in different breeds of Guinea fowl and Ducks respectively. Female Indigenous ducks had significantly ($P<0.05$) higher Total Serum Protein and Serum Globulin than the male ducks which is probably related to increased level of estrogens which induces protein synthesis in liver. Okeudo et al. (2003) and Oladele et al. (2007) were agreed with this finding in Nigerian and mallard ducks.

Table 1 Mean (±SE) Serum Biochemical parameters in White Pekin and Indigenous Ducks of Tamil Nadu (n=40)

Parameters	White Pekin Ducks	Indigenous Ducks	t value
Total Serum Protein (g/dl)	5.15 ± 0.13	4.38 ± 0.17	3.58**
Serum Albumin (g/dl)	1.85 ± 0.05	1.70 ± 0.05	2.19*
Serum Globulin (g/dl)	3.31 ± 0.12	2.70 ± 0.13	3.31**
Serum Cholesterol (mg/d)	147.79 ± 1.89	143.68 ± 1.54	1.68^{NS}
Serum Triglyceride (mg/dl)	107.39 ± 3.47	133.65 ± 3.52	5.30**
Serum Calcium (mg/dl)	12.24 ± 0.38	12.52 ± 0.47	0.47^{NS}

**- Highly Significant (P<0.01), * - Significant (P<0.05) and NS-Not Significant.

Table 2 Mean (±SE) Effect of Sex on Serum Biochemical parameters in White Pekin and Indigenous Ducks of Tamil Nadu (n=20)

Parameters	White Pekin Ducks			Indigenous Ducks		
	Male	**Female**	**t value**	**Male**	**Female**	**t value**
Total Serum Protein (g/dl)	4.54 ± 0.19	4.99 ± 0.73	1.81 **NS**	4.20 ± 0.19	4.89 ± 0.23	2.36*
Serum Albumin (g/dl)	1.72 ± 0.04	1.79 ± 0.06	0.89 **NS**	1.83 ± 0.08	1.94 ± 0.07	1.01 **NS**
Serum Globulin (g/dl)	2.81 ± 0.18	3.21 ± 0.15	1.69 **NS**	2.37 ± 0.14	2.96 ± 0.25	2.04*
Serum Cholesterol (mg/dl)	141.63 ± 2.95	153.65 ± 1.56	3.66**	140.32±1.71	147.05± 2.35	2.32*
Serum Triglyceride (mg/dl)	107.00 ± 3.68	107.76 ± 5.90	0.11 **NS**	130.59 ±5.23	137.36 ±4.51	0.97 **NS**
Serum Calcium (mg/dl)	11.30 ± 0.59	13.22 ± 0.35	2.73**	11.18 ± 0.51	13.93 ±0.66	3.30**

**- Highly Significant (P<0.01), * - Significant (P<0.05) and NS-Not Significant.

Breed had no significant influence in Serum Cholesterol between White Pekin and Indigenous ducks of Tamil Nadu. Female White Pekin and Indigenous ducks had significantly higher Serum Cholesterol level than the male ducks. This was agreed with the findings of Darshan *et al*. (1987) and Pampori and Iqbal (2007) in chicken. Serum Triglyceride was significantly (P< 0.01) higher in Indigenous ducks. Female White Pekin and Indigenous ducks of Tamil Nadu had significantly (P<0.01) higher Serum Calcium than the male ducks which is related to physiological processes needed for the reproductive functions during laying.

CONCLUSION

The present work concluded that White Pekin ducks had significantly higher Serum Protein, Albumin and Globulin while Indigenous ducks of Tamil Nadu had higher Serum Triglyceride. Serum cholesterol and Calcium level were higher in females of White Pekin and Indigenous ducks of Tamil Nadu. Hence, it was concluded both breed and sex had significant effect on Serum biochemical properties.

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