*Haryana Vet.* (June, 2023) **62(1),** 94-96 ISSN 0033-4359 (P) **Research Article**

# STUDY ON HEMATO-BIOCHEMICAL PARAMETERS OF CHICKEN BROILERS ON SUPPLEMENTATION OF SODIUM SULPHATE AND FISH OIL AS DIETARY SUBSTITUTE TO FISH MEAL

AMANDEEP*[1], D.S. BIDHAN[1], S. SAHU[1], D.C. YADAV[1], KOMAL[1] and RAVINDER SAINI[2]
[1]Department of Livestock Production Management, College of Veterinary Sciences, LUVAS, Hisar-125004, Haryana
[2]Veterinary Surgeon, Department of Animal Husbandry and Dairying, Govt. of Haryana

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## ABSTRACT

The present experiment was conducted to study the effect of Sodium Sulphate (SS) and Fish Oil (FO) supplementation on hemato-biochemical parameters of chicken broilers fed fish meal free diet. A total of one hundred and eighty, day-old broiler chicks were distributed into four treatments ($T_0$, $T_1$, $T_2$ & $T_3$) of 45 each, having three replicates of 15 chicks each. The treatment groups included- $T_0$ (Basal Diet - Fish Meal), $T_1$ (Basal Diet), $T_2$ (T0 + 0.35% SS) and $T_3$ (T0 + 0.35% SS + FO). Diets were formulated as per BIS (2007) standards and standard management practices were followed throughout the experiment. At the end of the experiment, there was significant ($P<0.05$) increase in total erythrocyte count (TEC), total leucocyte count (TLC) and serum high density lipoproteins (HDL) content of $T_3$ group of chicken broilers in comparison to all other treatments. Also, $T_3$ group of chicken broilers recorded significant ($P<0.05$) decrease in serum cholesterol, serum triglycerides and serum low density lipoproteins subscribed (LDL) content. However, hemoglobin (Hb), platelet and glucose content were comparable among all the dietary treatments. It was concluded that supplementing SS with FO is helpful in improving hemato-biochemical profile of chicken broilers.

**Keywords:** Broilers, Fish meal, Fish oil, Hemato-biochemical, Sodium sulphate

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Fish meal is a very good source to meet out the deficiency of some essential amino acids like lysine and methionine and is valued by farmers and nutritionists. Limited availability, lack of uniformity, higher cost relative to plant sources and storage issues due to its oxidizable nature responsible for rancidity are some strong reasons to find substitutes for fish meal in broiler diets. Availability and quality issues of fish meal aggravated during tough times of COVID pandemic. FO is consideredas an important source of long-chain n-3 polyunsaturated fatty acids (PUFA), eicosapentanoiec acid (EPA) and docosahexanoeic acid (DHA) and has been reported to improve the immune response of chicken broilers (Navid Hosseini-Mansoub, 2011; Barua *et al.*, 2017) and decreases blood amounts of cholesterol and triglyceride (Navid Hosseini-Mansoub, 2011; Bharath, 2014; Barua *et al.*, 2017). Plasma triglycerides, total cholesterol, LDL and HDL content of broilers fed diets with different sources of oils were similar (Attia *et al.*, 2020). Incorporation of SS and methionine in all vegetable rations replaces fish meal and has no significant effect on hematological parameters (Hb, TEC, TLC and platelets) of chicken broilers (Akpet *et al.*, 2009). Supplementation of methionine and SS in full fat soya ration could completely replace fish meal without affecting cost of production (Himanshu *et al.*, 2008).

Keeping in view the constraints and need of poultry industry,the present investigation was planned to study the effect of SS and FO supplementation in fish meal free ration on hemato-biochemical parameters of chicken broilers.

*Corresponding author: aghanghas1231@gmail.com

## MATERIALS AND METHODS

The present study was attempted to analyze the effect of supplementation of SS and FO on the hemato-biochemical parameters of broilers from day old to 42 days of age, starting from March 4, 2021 at the Poultry Section of the Department of Livestock Production Management, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar. The experiment was approved by the Institutional Animal Ethics Committee.

A total of 180 unsexed day old broiler chicks of VenCobb-400 were purchased from a reputed local hatchery. The chicks were allocated using randomized design based in four groups each having 45 chicks and each treatment group was further divided into three replicates consisting 15 chicks each. Each group was fed with rations formulated as per BIS (2007) specifications. The treatment groups included the $T_0$ (Basal Diet - Fish Meal) as negative control group, $T_1$ (Basal Diet) as control group, $T_2$ ($T_0$ + 0.35% SS) and $T_3$ ($T_0$ + 0.35% SS + FO). Before formulating the broiler rations, the feed ingredients were analyzed (AOAC, 2013) for proximate composition (Table 1). The experimental chicks were reared under strict hygienic conditions. Standard management practices including brooding, proper lighting, vaccination, raking of litter, cleaning of feeders, waterers, etc. were followed throughout the experiment.

For hematology, at the end of the feeding trial, blood

samples were collected from nine broilers per treatment (three broilers per replicate) and thus a total of 36 samples were analysed. Haematological parameters such as Hb, TEC, TLC and platelets count were analyzed with the automated haematology analyser MS45 blood cell counter.

For serum biochemical parameters, clear, non-haemolysed sera was collected by centrifuging the blood samples. Fully automated Random Access Clinical Chemistry Analyzer (EM 200TM Erba Mannheim - Germany) was employed for estimation of biochemical parameters using kits procured from Transasia Biomedical Limited. Serum samples were analysed for different serum variables like total cholesterol, glucose, triglyceride, HDL and LDL.

Statistical Analysis Data obtained were subjected to statistical analysis as per Snedecor and Cochran (1994) using Completely Randomized Design (CRD). All the data were subjected to ANOVA using the General Linear Models procedure of SPSS software (v-16). The mean differences among different treatments were separated by Duncan's multiple range tests. Consequently, a significance level of 5% ($P<0.05$) was used as the criterion for statistical significance (Duncan, 1955).

## RESULT AND DISCUSSION

The effect of SS and FO on mean hemato-biochemical parameters of chicken broilers is presented in Table 2 & 3. Dietary supplementation of SS with FO significantly ($P<0.05$) influenced the hemato-biochemical parameters of chicken broilers in comparison to SS supplemented group, control group and negative control group. Among hemato-biochemical parameters, TEC, TLC, cholesterol, triglycerides, HDL and LDL content of chicken broilers were significantly improved in group supplemented with combination of SS and FO. However, the effect was non-significant on Hb, platelet and glucose content of chicken broilers. The TLC, TEC and HDL content of $T_3$ group were significantly ($P<0.05$) high as compared to $T_2$, $T_1$ and $T_0$ group of chicken broilers. On the other hand, cholesterol, triglycerides and LDL content of $T_3$ group were significantly ($P<0.05$) lower as compared to $T_2$ group. The $T_1$ and $T_0$ group of chicken broilers. All the hemato-biochemical parameters were comparable between $T_2$, $T_1$ and $T_0$.

The results of TLC count of present study were in agreement with Ali *et al.* (2016). The researchers reported higher TLC levels in blood of chicken broilers supplemented with 0.5% SS in diet of chicken broilers. However, contrary to present study, the researchers reported non- significant differences in TEC content among various treatment groups. In contrary to present findings of TLC and TEC, Akpet *et al.* (2009) concluded that chicken broilers fed maize-soyabean diet supplemented with different levels of methionine and inorganic sulphate has no significant effect on TLC and TEC count of chicken broilers.

**Table 1. Chemical composition (% DM basis) and metabolizable energy (ME, Kcal/kg) of ingredients used in formulating the experimental diets**

| S.No. | Ingredient | CP (%) | EE (%) | CF (%) | TA (%) | ME* (kcal/kg) |
|---|---|---|---|---|---|---|
| 1. | Maize | 10.15 | 3.9 | 2.25 | 1.5 | 3300 |
| 2. | Soybean Meal | 45 | 1.2 | 3.5 | 5.6 | 2250 |
| 3. | Groundnut Cake | 42 | 1.20 | 7.5 | 7.5 | 2400 |
| 4. | Fish Meal | 47.8 | 6.9 | 1.22 | 26.5 | 2180 |
| 5. | Vegetable Oil | – | 99.4 | – | – | 8800 |
| 6. | Fish Oil | - | 99.4 | - | - | 8800 |
| 6. | Mineral Mixture | – | – | – | – | – |
| 7. | Sodium Sulphate | - | - | - | - | - |

*Calculated values (Singh and Panda, 2002)

**Table 2. Effect of Sodium Sulphate and Fish Oil on mean hematological parameters of chicken broilers at 42 day**

| Parameter | TREATMENTS | | | |
|---|---|---|---|---|
| | $T_0$ | $T_1$ | $T_2$ | $T_3$ |
| Hb (g/dl) | 9.06±0.39 | 9.47±0.33 | 9.54±0.34 | 9.74±0.35 |
| TEC (million/$mm^3$) | $25.67^a$±1.15 | $25.89^a$±1.13 | $25.78^a$±1.46 | $28.22^b$±0.76 |
| TLC (thousand /$mm^3$) | $2.96^a$±0.15 | $3.11^a$±0.14 | $3.12^a$±0.15 | $3.64^b$±0.05 |
| PLATELETS (thousands/µl) | 27.44±1.30 | 27.22±1.46 | 27.67±1.22 | 27.44±1.29 |

Each value is a mean of three replicates. (n=45); Means bearing different superscripts, differ significantly ($P<0.05$) row wise.

Concomitant to present findings, Saleh *et al.* (2009); Navid Hosseini- Monsoub (2011); Bharath (2014) and Barua *et al.* (2017) reported significant ($P<0.05$) decrease in serum cholesterol and triglycerides content of chicken broilers which might be due to regulation of triacylglycerols and lipoproteins by n-3 PUFA (FO) resulting in lower triglycerides and apolipo protein synthesis {Crespo N. and Esteve-Garcia E. (2003)}. Diverging to present findings, Rahimi *et al.* (2005) reported no effect on plasma triglycerides levels due to inclusion of SS in diets of chicken broilers. Also, Ali *et al.* (2016) reported higher cholesterol levels in serum of broilers fed 0.5% SS in diets of chicken broilers.

The present findings of serum HDL levels were in agreement with Bharath (2014) and Barua *et al.* (2017). The researchers observed significantly ($P<0.05$) higher levels of HDL in serum of chicken broilers in FO fed groups.

Similar to the findings of Barua *et al.* (2016), the serum LDL levels were significantly ($P<0.05$) lowered in

**Table 3. Effect of Sodium Sulphate and Fish Oil on mean serum biochemical parameters of chicken broilers at 42 day**

| Parameter | TREATMENTS | | | |
|---|---|---|---|---|
| | $T_0$ | $T_1$ | $T_2$ | $T_3$ |
| GLUCOSE (mg/dl) | 211.89±2.71 | 212.56±2.85 | 214.44±2.66 | 215.56±2.43 |
| CHOLESTEROL (mg/dl) | $171.78^{b}$ ±1.23 | $169.22^{b}$ ±0.94 | $169.33^{b}$ ±0.88 | $157.67^{a}$ ±0.71 |
| TRIGLYCERIDES (mg/dl) | $37.11^{b}$ ±0.42 | $36.22^{b}$ ±0.22 | $36.11^{b}$ ±0.31 | $30.56^{a}$ ±0.60 |
| HDL (mg/dl) | $120.33^{a}$ ±3.77 | $121.22^{a}$ ±3.23 | $120.22^{a}$ ±5.42 | $126.89^{b}$ ±3.33 |
| LDL (mg/dl) | $37.11^{b}$±0.67 | $35.22^{b}$±0.76 | $35.44^{b}$±1.52 | $23.78^{a}$±0.66 |

Each value is a mean of three replicates. (n=45); Means bearing different superscripts, differ significantly (P<0.05) row wise.

present studyl. These lowered LDL levels might be due to reduction in very low density lipoprotein (VLDL) levels which helps in lowering the free circulating LDL in blood {Navid Hosseini- Monsoub (2011); Crespo N. and Esteve-Garcia E. (2003)}.

The serum glucose differed non-significantly in present study among all treatment groups. In contrary to this, Navid Hosseini-Monsoub (2011) reported significantly higher glucose levels in serum of chicken broilers fed FO. In contrary to findings of present study, Attia *et al.* (2020) reported no significant differences in serum glucose, cholesterol, triglycerides, HDL and LDL content of chicken broilers fed with different sources of oils, namely FO, canola oil, coconut oil and mixture of above three oils.

## CONCLUSION

From the findings of present study, it can be concluded that dietary supplementation of SS with FO significantly (P<0.05) increased TEC, TLC and serum HDL content and significantly (P<0.05) decreased serum cholesterol, triglycerides and LDL content of chicken broilers.

## COMPETING INTERESTS

The authors declare no competing interest regarding publication of this paper.

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