
**ISSN Print:** 2664-844X
**ISSN Online:** 2664-8458
NAAS Rating (2025): 4.97
IJAFS 2025; 7(11): 22-25
www.agriculturaljournals.com
Received: 06-09-2025
Accepted: 07-10-2025

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# Effect of Different Levels of Saccharomyces cerevisiae Supplementation on Blood Biochemical Profile of Broiler Chickens

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**DOI:** https://www.doi.org/10.33545/2664844X.2025.v7.i11a.937

**Abstract**
The present investigation was conducted to assess the effect of different levels of Saccharomyces cerevisiae supplementation on the blood biochemical profile of broiler chickens. A total of 120-day-old Cobb-400 chicks were randomly allotted to four dietary treatments: $T_0$ (control), $T_1$ (1.0% yeast), $T_2$ (1.5% yeast), and $T_3$ (2.0% yeast), each with five replicates of six birds. Blood samples were collected on the 21st and 42nd days of age for the estimation of serum metabolites and enzyme activities. The results revealed that dietary supplementation of yeast significantly ($p<0.05$) influenced lipid and protein metabolism. Birds in $T_2$ exhibited the lowest serum cholesterol, LDL, and triglyceride levels, and the highest HDL, total protein, and albumin concentrations. Liver enzyme activities (ALT, AST, ALP) were also reduced in $T_2$, indicating improved hepatic health. The findings suggest that inclusion of S. cerevisiae at 1.5% enhances serum lipid metabolism, protein synthesis, and liver function in broilers, thereby improving overall physiological performance.

**Keywords:** Broiler, Saccharomyces cerevisiae, Blood profile, Biochemical parameters, Liver enzymes

## Introduction
Blood biochemical parameters serve as important indicators of the physiological, nutritional, and metabolic status of poultry. They reflect the functional condition of vital organs such as the liver, kidney, and heart, and provide insight into the animal's response to dietary modifications. Evaluation of blood constituents, including lipid profile, protein status, and enzyme activity, offers valuable information on nutrient utilization, liver function, and overall health of birds under experimental conditions.

In modern poultry production, the need for safe and effective feed additives has become increasingly important following restrictions on the use of antibiotic growth promoters. Among the natural alternatives, yeast and yeast-based products have gained considerable attention due to their multifaceted nutritional and probiotic properties. Saccharomyces cerevisiae, in particular, is rich in proteins, essential amino acids, vitamins, minerals, β-glucans, and mannan oligosaccharides, which contribute to improved digestion, enhanced immune response, and modulation of gut microflora. These factors indirectly influence the biochemical composition of blood by supporting better liver function, efficient lipid metabolism, and improved nutrient assimilation.

Previous studies have reported beneficial effects of yeast supplementation on serum cholesterol, triglycerides, total protein, and enzyme activity in poultry. Onifade *et al.* (1999) [1] observed improved blood biochemical indices in broilers supplemented with S. cerevisiae, while Santin *et al.* (2001) and Paryad and Mahmoudi (2008) [2, 3] reported enhanced protein metabolism and reduced lipid levels. Goli and Shahryar (2015) [4] found decreased hepatic enzyme activities, suggesting hepatoprotective effects of yeast supplementation. However, variations in yeast strain, dosage, and dietary composition have resulted in inconsistent responses among studies. In view of these considerations, the present study was undertaken to evaluate the influence of different levels of Saccharomyces cerevisiae supplementation (1.0%, 1.5%, and 2.0%) on the serum biochemical and enzyme profile of broiler chickens.

## Materials and Methods

The experiment was carried out at the Poultry Unit, Division of Animal Husbandry and Dairy Science, College of Agriculture, Dhule, Maharashtra. A total of 120-day-old Cobb-400 broiler chicks were randomly allotted to four dietary treatments: $T_0$ (control diet), $T_1$ (basal diet + 1.0% Saccharomyces cerevisiae), $T_2$ (basal diet + 1.5% S. cerevisiae), and $T_3$ (basal diet + 2.0% S. cerevisiae). Each treatment consisted of five replicates with six birds per replicate. The experimental design followed a completely randomized design (CRD).

The birds were reared under uniform managemental and hygienic conditions for a period of 42 days. The diets were formulated as per the Bureau of Indian Standards (BIS, 1992) recommendations for broilers, ensuring the nutrient requirements of starter (0-21 days) and finisher (22-42 days) phases. Feed and water were provided ad libitum. Routine vaccination and biosecurity measures were strictly followed throughout the experimental period.

At the end of the 21st and 42nd days of the feeding trial, approximately 2 mL of blood was collected from the wing vein of one bird per replicate using sterile syringes. The samples were allowed to clot and centrifuged at 3000 rpm for 10 minutes to separate the serum, which was then stored at -20°C until analysis. Serum samples were analyzed for lipid profile parameters cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and triglycerides using enzymatic colorimetric methods (CHOD-PAP and GPO-PAP). Total protein and albumin concentrations were determined by the Biuret and Bromocresol Green methods, respectively. Serum bilirubin, creatinine, and urea were estimated by standard biochemical kits, while liver enzyme activities including alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase (ALP) were measured using commercial diagnostic kits (Span Diagnostics Ltd., India) following the manufacturer's instructions.

All data were subjected to one-way analysis of variance (ANOVA) using standard statistical procedures. Differences among treatment means were compared using the Critical Difference (CD) test at 5% level of significance. The results are presented as mean ± standard error (SE).

## Results and Discussion

The results of the present study revealed that supplementation of *Saccharomyces cerevisiae* at different levels had a significant ($p$<0.05) influence on the serum lipid profile of broilers. By the 21st day of feeding, yeast supplementation had already initiated beneficial physiological effects, as indicated by reduced serum cholesterol, LDL, and triglyceride levels, along with increased HDL and total protein concentrations compared to the control. Although the differences were moderate at this stage, the early improvement suggested that *S. cerevisiae* positively influenced lipid metabolism and protein synthesis from the initial phase of feeding. Similar early responses to probiotic yeast supplementation were also reported by Paryad and Mahmoudi (2008) and Santin *et al*. (2001) [2, 3].

**Table 1:** Effect of yeast supplementation on serum metabolites of broilers at 42 days

| Treatments | Cholesterol (mg/dL) | HDL (mg/dL) | LDL (mg/dL) | Triglyceride (mg/dL) | Total Protein (g/dL) | Albumin (g/dL) |
|---|---|---|---|---|---|---|
| $T_0$ (Control) | 130.90$^a$ | 67.10$^c$ | 32.10$^a$ | 104.70$^a$ | 2.85$^b$ | 1.54$^a$ |
| $T_1$ (1 %) | 118.80$^b$ | 70.40$^b$ | 30.10$^b$ | 96.20$^b$ | 2.93$^b$ | 1.49$^b$ |
| $T_2$ (1.5 %) | 93.20$^c$ | 73.10$^a$ | 28.50$^c$ | 91.40$^c$ | 3.15$^a$ | 1.56$^a$ |
| $T_3$ (2 %) | 97.50$^c$ | 71.40$^a$ | 28.90$^c$ | 89.60$^c$ | 2.90$^b$ | 1.48$^b$ |
| SE of Mean | 0.26 | 0.34 | 0.22 | 0.32 | 0.03 | 0.01 |
| CD @ 5 % | 0.76 | 1.02 | 0.64 | 0.98 | 0.09 | 0.02 |

At the end of the trial (42 days), the effect became more pronounced. The mean cholesterol concentration decreased from 130.90 mg/dL in the control group to 93.20 mg/dL in $T_2$, showing a highly significant ($p$<0.05) hypocholesterolemic effect. As shown in *Table 1 and Figure 1*, *Figure 2*, *Figure 3*. This could be attributed to the ability of yeast to bind bile acids and enhance their excretion, thus reducing cholesterol absorption and synthesis.

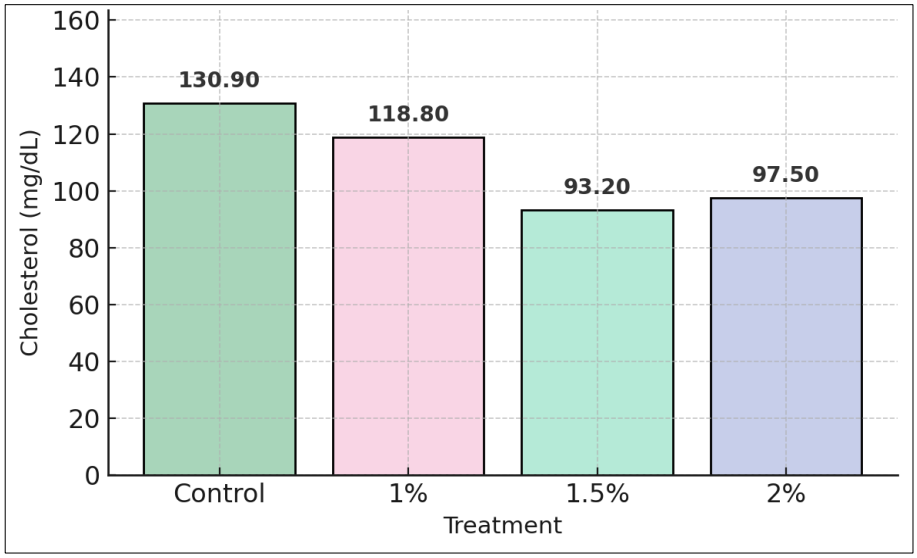


**Fig 1:** Effect of yeast supplementation on serum cholesterol of broilers.

HDL levels increased significantly ($p$<0.05) in yeast-supplemented groups, with $T_2$ recording the highest value (73.10 mg/dL) As shown in *figure 2*. Enhanced HDL levels reflect improved reverse cholesterol transport, indicating better cardiovascular health in birds. Conversely, LDL and triglyceride concentrations were reduced significantly in supplemented groups, especially in $T_2$, suggesting improved lipid utilization and hepatic function.The findings are consistent with reports of Onifade *et al.* (1999) [1], who demonstrated a reduction in serum cholesterol and triglycerides with yeast inclusion in broiler diets. Similarly, Colvard *et al*. (2014) and Zhou *et al*. (2022) [5, 6] observed that probiotic supplementation lowered LDL and triglyceride concentrations while improving HDL in poultry.

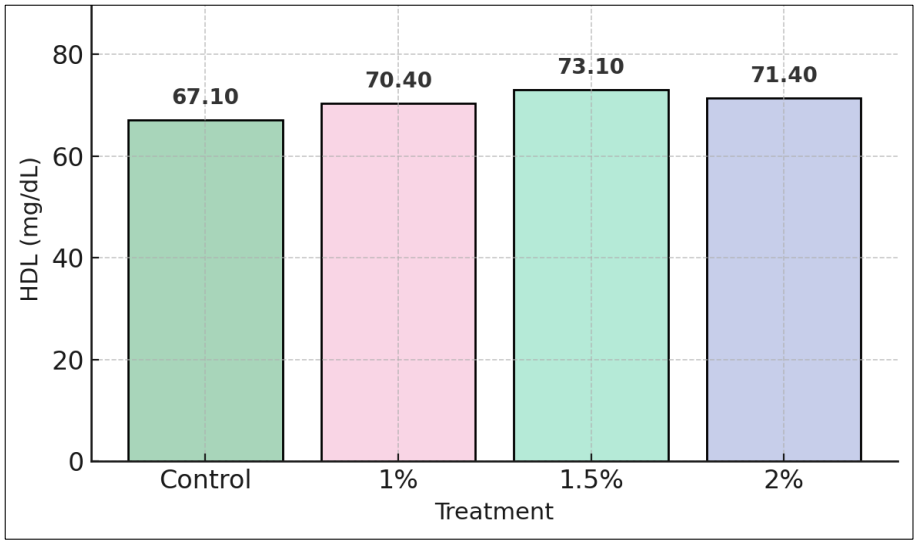


**Fig 2:** Effect of yeast supplementation on serum HDL of broilers

Yeast supplementation significantly improved serum total protein and albumin concentrations ($p$<0.05). At 42 days, the highest total protein (3.15 g/dL) and albumin (1.56 g/dL) values were recorded in $T_2$, while the lowest were in the control group (2.85 and 1.54 g/dL, respectively). The improvement in protein parameters may be due to enhanced microbial enzyme activity, increased digestibility of nutrients, and better intestinal health resulting from yeast supplementation. These results are in agreement with Santin *et al*. (2001) [2], who reported enhanced protein metabolism and immune status in broilers fed diets containing yeast cell wall components. The mannan oligosaccharides and β-glucans in yeast may also stimulate gut health and protein turnover, leading to improved serum protein indices.

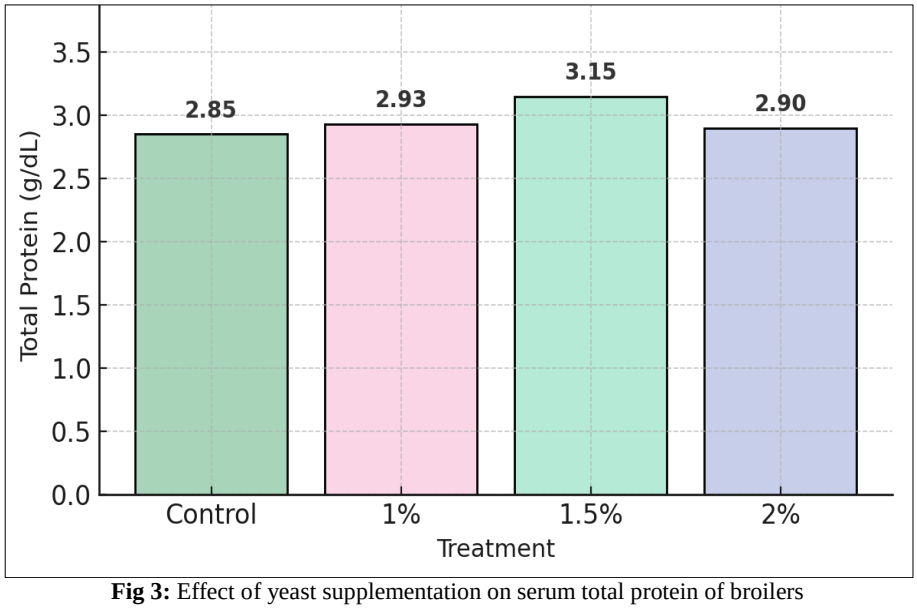


**Fig 3:** Effect of yeast supplementation on serum total protein of broilers

The biochemical parameters associated with hepatic and renal function were also affected by dietary treatments. Serum bilirubin and creatinine concentrations showed a declining trend with increasing levels of yeast supplementation. The lowest bilirubin (0.42 mg/dL) and creatinine (0.23 mg/dL) were recorded in $T_2$, suggesting reduced hepatic stress and improved renal function. These findings are comparable to those of Goli and Shahryar (2015) [4], who observed decreased hepatic enzyme activity and bilirubin levels in yeast-fed birds.

**Table 2:** Effect of yeast supplementation on serum enzymes and biochemical parameters of broilers at 42 days

| Treatments | Bilirubin (mg/dL) | Creatinine (mg/dL) | Urea (mg/dL) | ALT (IU/L) | AST (IU/L) | ALP (IU/L) |
|---|---|---|---|---|---|---|
| $T_0$ (Control) | 0.48[a] | 0.28[a] | 8.70[c] | 10.30[a] | 332.60[a] | 3280.10[a] |
| $T_1$ (1 %) | 0.43[b] | 0.24[b] | 9.20[b] | 9.90[c] | 321.80[c] | 3101.40[c] |
| $T_2$ (1.5 %) | 0.42[b] | 0.23[b] | 9.60[a] | 9.45[d] | 305.20[d] | 2945.30[d] |
| $T_3$ (2 %) | 0.45[a] | 0.25[b] | 9.40[a] | 10.05[b] | 330.10[b] | 3180.20[b] |
| SE of Mean | 0.01 | 0.01 | 0.02 | 0.07 | 0.85 | 11.80 |
| CD @ 5 % | 0.02 | 0.02 | 0.06 | 0.19 | 2.52 | 34.90 |

Serum urea concentration did not differ significantly among treatments but remained within the physiological range. The liver enzymes ALT, AST, and ALP showed notable reductions in yeast-supplemented groups, with $T_2$ recording the lowest values. As shown in *Table 2* and *Figure 4*. Reduced enzyme activity suggests better hepatocellular integrity and protection against oxidative stress. Similar hepatoprotective effects of *S. cerevisiae* have been reported by Soren *et al*. (2024) [7], attributing them to improved gut-liver axis modulation and reduced metabolic load on hepatic tissue.

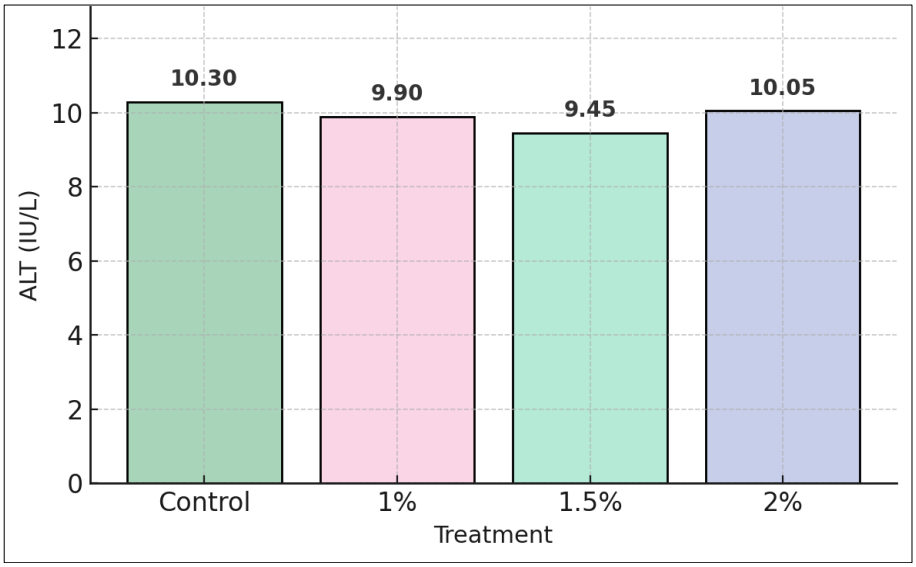


**Fig 4:** Effect of yeast supplementation on ALT activity of broilers.

Overall, the inclusion of *Saccharomyces cerevisiae* at 1.5% ($T_2$) was found to be optimal for improving serum lipid metabolism, protein synthesis, and hepatic function in broilers. The consistent improvement across multiple blood parameters indicates a synergistic effect of yeast nutrients, enzymes, and bioactive compounds on metabolic regulation. The observed trends support the role of *S. cerevisiae* as a natural growth promoter capable of enhancing physiological performance without the need for antibiotics.

## Conclusion

Dietary supplementation of Saccharomyces cerevisiae at 1.5% ($T_2$) in broiler diets significantly improved lipid metabolism, protein synthesis, and liver enzyme activity. The findings suggest that yeast supplementation enhances physiological efficiency and biochemical health in broilers without adverse effects.

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