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EFFECT OF DIETARY CRUDE PROTEIN LEVELS ON IMMUNE RESPONSE TO NEWCASTLE DISEASE VIRUS VACCINATION IN ASEEL CHICKENS

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Abstract: The present experiment was conducted to study the effect of varying levels of dietary crude protein (CP) with isocaloric diets on the immune response of Aseel chickens vaccinated against Newcastle Disease (ND) virus. Two-hundred-and-ten (210), day old sex-separated Aseel chicks were randomly distributed into seven dietary treatment groups, each with three replicates of ten birds (five males and five females). The treatments consisted of diets containing 18.5, 19.0, 19.5, 20.0, 20.5, 21.0 and 21.5% CP with a constant metabolizable energy of 2800 kcal/kg. Serum samples collected at 16 weeks were analyzed for antibody titres by hemagglutination inhibition (HI) test. The mean HI titre values (log_2) were 6.17, 6.00, 5.83, 6.33, 6.50, 6.67 and 6.83 for T_1 to T_7, respectively, showing no significant difference ($P>0.05$). The results suggest that moderate variation in CP levels does not adversely affect antibody response to ND vaccination in Aseel chickens.
Keywords: Aseel chicken, crude protein, immune response, Newcastle disease.

1. INTRODUCTION

Aseel is an ancient and well-adapted indigenous chicken breed of India, long valued for its robustness, adaptation to harsh environments, and disease resistance. Traditionally reared under backyard and semi-intensive systems, Aseel chickens have relatively lower growth rates and moderate egg production (typically 90–120 eggs per year), but they compensate by high survivability and resilience to environmental stressors [6,7]. More recently, due to growing demand for native poultry products, Aseel chicks are increasingly being reared under intensive or semi-intensive systems to enhance productivity and meet consumer demand [10]. This shift enables efficient production while retaining the breed's adaptive advantages.

Nutrition plays a critical role in regulating both performance and immune competence in poultry. Protein, being the most vital macronutrient, directly influences the synthesis of antibodies, cytokines, and immune cells. Inadequate dietary protein reduces immune

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responsiveness, while excessive protein intake can lead to metabolic burden and oxidative stress [8,9]. Optimizing dietary crude protein (CP) levels is therefore essential to balance growth, immunity and feed cost.

Aseel chickens fed diets containing 21% CP exhibited superior growth rate, carcass yield, and myostatin gene expression compared to lower CP levels, confirming that native birds can respond positively to enhanced protein supply under isocaloric diets [10]. However, the effect of such variation on the immune response of intensively reared Aseel chicks remains limited. Hence, the present study was undertaken to evaluate the impact of graded dietary CP levels (18.5–21.50 %) on ND vaccine antibody response in Aseel chickens under isocaloric conditions.

2. MATERIALS AND METHODS

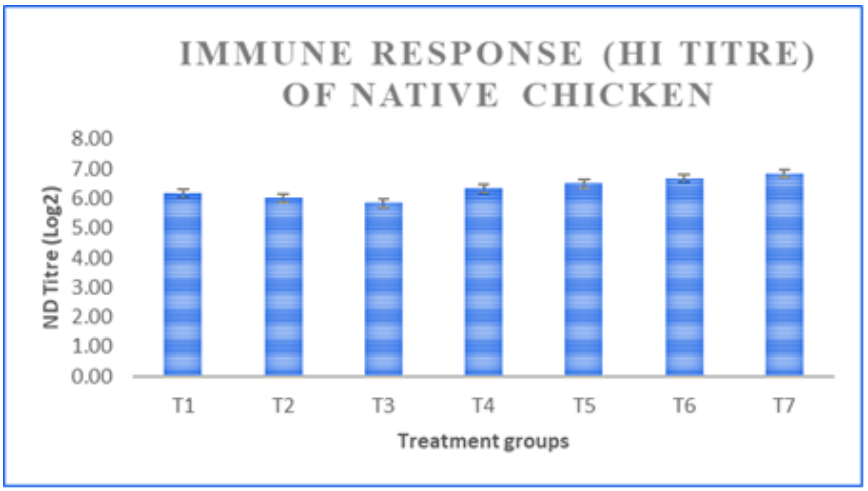
Two hundred and ten (210) day-old, sex-separated Aseel chicks were procured from the Department of Poultry Science, Veterinary College and Research Institute, Namakkal. The birds were individually wing-banded, weighed, and randomly allotted to seven treatment groups (T_1–T_7) with three replicates of ten chicks each (five males and five females). Seven isocaloric (2800 kcal ME/kg) diets were formulated based on BIS, 2007 standards [1] for layer chicks with crude protein levels of 18.5, 19.0, 19.5, 20.0, 20.5, 21.0 and 21.5%, corresponding to treatments T_1 to T_7, respectively. Feed and water were provided ad libitum.

Aseel chicks were reared on deep litter from day-old to 16 weeks of age under uniform managemental conditions. Vaccination against ND was carried out on day 5 (F1), day 21 (Lasota), and day 56 (R_2B). At 16 weeks, serum samples were collected from six birds per treatment. ND antibody titres were determined using the hemagglutination inhibition (HI) test employing four HI units of ND virus antigen. Results were expressed as $\log_2$ HI titre values. Data were analyzed under a Completely Randomized Design (CRD) and differences among treatment means were tested for significance at $P<0.05$.

3. RESULTS AND DISCUSSION

The mean ND antibody titre ($\log_2$) values for T_1 (20.0% CP), T_2 (18.5%), T_3 (19.0%), T_4 (19.5%), T_5 (20.5%), T_6 (21.0%) and T_7 (21.5%) were 6.17 ± 0.48, 6.00 ± 0.45, 5.83 ± 0.48, 6.33 ± 0.21, 6.50 ± 0.22, 6.67 ± 0.42 and 6.83 ± 0.31, respectively. No significant differences were observed among treatments, indicating that crude protein levels within this range did not influence the antibody response to ND vaccination (Fig. 1).

Figure 1. Effect of varying protein with isocaloric (2800 kcal/kg) diets on immune response (ND HI titre) of native chicken at 16 weeks of age



These results demonstrate that antibody titres remained within the protective range (>6 $\log_2$), suggesting adequate immunocompetence across treatments. Previous studies indicate that varying dietary CP (17–26 %) in broiler chickens had no significant impact on ND antibody titres [2]. Similarly, Aseel chickens maintained optimal HI titres (6.8–6.9 $\log_2$) when fed diets containing 16–20 % CP [3]. However, in Vanaraja chickens, a synchronous increase in ND antibody titre was noted with higher CP and energy levels [4]. Swarnadhara chicks also showed non-significant variation in antibody titres across dietary protein levels [5].

Similarly, Broilers fed diets containing between 17–26% CP showed no significant variation in ND antibody titres [2]. Likewise, this study confirms that Aseel chickens sustain optimal antibody titres (6.0–6.8 $\log_2$) even when dietary CP levels vary moderately, supporting feed formulation flexibility without compromising immune performance.

4. CONCLUSION

Moderate variation in dietary crude protein (18.5–21.5%) does not significantly affect the antibody titre response to Newcastle Disease vaccination in Aseel chickens. This demonstrates that Aseel birds maintain robust immune competence across a practical dietary CP range, providing flexibility in feed formulation for cost-effective and sustainable native chicken production.

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REFERENCES

[1] BIS (2007). Nutrient Requirements of Poultry – Specifications. Bureau of Indian Standards, New Delhi.

[2] Golian, A., Kermanshahi, H., Toghyani, M., and Alinejad, A. (2010). Effect of different levels of crude protein on humoral immune response in broiler chicks. Journal of Animal and Veterinary Advances, 9(3): 452–456.

[3] Haunshi, S., Shanmugam, M., Padhi, M.K., Niranjan, M., Rajkumar, U., and Chatterjee, R.N. (2012). Evaluation of immune competence of Aseel chicken under varied protein levels. Indian Journal of Animal Sciences, 82(2): 170–173.

[4] Perween, N., Panda, A.K., Sahu, N.P., and Raju, M.V.L.N. (2016). Influence of dietary protein and energy levels on immune response in Vanaraja chickens. Veterinary World, 9(8): 833–837.

[5] Joseph, J., Reddy, V.R., and Ramesh, J. (2017). Effect of dietary protein levels on antibody titre against Newcastle disease in Swarnadhara chicks. Indian Journal of Poultry Science, 52(1): 45–48.

[6] Singh, R.V., and Kumar, S. (2019). Performance of Aseel chicken under backyard system of rearing in tropical India. Indian Journal of Poultry Science, 54(3): 265–270.

[7] Rajkumar, U., Haunshi, S., Padhi, M.K., Niranjan, M., & Chatterjee, R.N. (2011). Characterization of indigenous Aseel chicken breed for production, reproduction and immune traits. Indian Journal of Animal Sciences, 81(9): 990–993.

[8] Klasing, K.C. (2007). Nutrition and the immune system. British Poultry Science, 48(5): 525–537.

[9] Kidd, M.T. (2004). Nutritional modulation of immune function in broilers. Poultry Science, 83(4): 650–657.

[10] Kumaravel, V., Mohan, B., Natarajan, A., Murali, N., Selvaraj, P., and Vasanthakumar, P. (2023). Effect on growth performance, carcass traits, and myostatin gene expression in Aseel chicken fed varied levels of dietary protein in isocaloric energy diets. Tropical Animal Health and Production, 55:82. DOI:10.1007/s11250-023-03505-7.