



ISSN: 2456-2912

VET 2023; 8(5): 297-299

© 2023 VET

www.veterinarypaper.com

Received: 17-06-2023

Accepted: 23-08-2023

Sourabh Yogi

Ph.D. Scholar, Department of Livestock Production, Management, College of Veterinary Science and A.H., Anjora, DSVCKV, Durg, Chhattisgarh, India

VN Khune

Professor, Department of Livestock Production Management, College of Veterinary Science and A.H., Anjora, DSVCKV, Durg, Chhattisgarh, India

Dr. C Sannat

Assistant Professor, Department of Veterinary Microbiology, College of Veterinary Science and A.H., Anjora, DSVCKV, Durg, Chhattisgarh, India

OP Dinani

Assistant Professor, Department of Instructional Livestock Farm Complex, College of Veterinary Science and A.H., Anjora, DSVCKV Durg, Chhattisgarh, India

AK Santra

Professor and Head, Department of Livestock Production Management, College of Veterinary Science and A.H., Anjora, DSVCKV, Durg, Chhattisgarh, India

N Singh

Assistant Professor, Department of Livestock Production, Management, College of Veterinary Science and A.H., Anjora, DSVCKV, Durg, Chhattisgarh, India

V Bhagat

Assistant Professor, Department of Livestock Production Management, College of Veterinary Science and A.H., Anjora, DSVCKV, Durg, Chhattisgarh, India

Corresponding Author:

Sourabh Yogi

PhD Scholar, Department of Livestock Production, Management, College of Veterinary Science and A.H., Anjora, DSVCKV, Durg, Chhattisgarh, India

A comparative study of the immune responsiveness in native chickens of Chhattisgarh, PB2 and their crosses under intensive system

Sourabh Yogi, VN Khune, C Sannat, OP Dinani, AK Santra, N Singh and V Bhagat

Abstract

Immunity is a very important trait in rural poultry. The present experiment was a comparative study of the immune responses of local native chickens (T_1), PB2, a colour broiler (T_2), and crossbreed F1 (T_3). In the study of cell-mediated immunity that is evoked by PHA-P injection, immunity values in terms of foot index for T_1 , T_2 , and T_3 were found to be 0.08 ± 0.03 , 0.10 ± 0.02 and 0.11 ± 0.01 , respectively. In the study of humoral immunity, a 1% sheep RBC solution was injected. After 5 days, the mean HA titres of T_1 , T_2 and T_3 were found to be 4.5 ± 0.2 , 8.33 ± 1.0 and 8.16 ± 0.4 respectively. A T_1 4th day mean titers of T_1 , T_2 and T_3 were found to be 7.0 ± 0.2 , 10.16 ± 0.4 , and 10.0 ± 0.2 respectively. On the 5th and 14th day significantly lower immune response was reported in T_1 whereas T_2 and T_3 were not differed statistically. At 21th day, mean HA titres of T_1 , T_2 and T_3 were found as 5.16 ± 0.6 , 5.50 ± 1.0 and 6.33 ± 1.2 respectively.

Keywords: Cell mediate immune response, humoral immunity, native chicken, PB2, crossbreed, PHAP, SRBC

1. Introduction

The Indian government and research institutes are continuously developing and propagating improved varieties of chicken for sustainable production in intensive and backyard systems. New poultry varieties are exhibiting higher productivity but are facing the disease outbreak, even though vaccination programmes are in place. Hence, improvements in immunity have enduring effects on the population. Disease resistance in poultry is controlled by several genes. Disease resistance is important for maintaining health and protecting the chicken from various pathogenic organisms. Disease resistance traits of different breeds and varieties have been studied; they are very important in breed development programs. Disease resistance can be analysed by studying the immune status of chickens. It is called immunocompetence traits. The sheep RBCs act as a foreign antigen for chickens. It is used for assessing the humoral response of an individual without affecting their health. After inoculation of sheep RBC, it produces specific antibody titres (anti-SRBC), which are used as a tool to determine the humoral immune response. It was found that individuals with a higher SRBC response also reported higher antibodies against Marek's disease, Ranikhet disease virus, and coccidia. Humoral immune response is moderately heritable, so it is important for disease resistance, increased vaccine efficacy, and the health status of farms. And *in vivo* mitogen PHA-P to quantify the lymph proliferative cell-mediated immune response.

2. Material and methods

The present investigation was carried out at the College of Veterinary Science and A.H. Anjora, Durg Chhattisgarh, on local native chickens (T_1), PB₂ colour broilers (T_2), and F1 (crosses of native male and PB₂ female) birds (T_3). 240 chicks were reared in each group for 14 weeks. At the 10th week for cell-mediated immune response evaluation, 6 birds per group were selected randomly that were free from disease, and similarly, 6 birds per group were selected for the humoral immune response study.

2.1 Humoral Immune Response

The immune response of the birds was determined by haemagglutination titres against sheep red blood cells (SRBC). SRBC acts as an antigen. (Rajkumar *et al.*, 2011) [1]. 20 ml of blood from a sheep was taken in an equal amount of Alsever's solution. Blood collected in Alsever's solution had been kept in a plastic test tube after removing the supernatant. Alsever centrifuged it at 2500 rpm for 10 minutes, then washed it three times in phosphate-buffered saline solution till the supernatant was cleared. 1 ml of sheep RBC (PCV) was mixed in 99 ml of PBS solution to make a 1% sheep RBC suspension and kept in the refrigerator at 4 °C until further usage.

6 birds per group were injected with one ml of 1% sheep RBC suspension intravenously at 10th weeks of age. One ml of blood was collected on 5th, 14th and 21st day of post-immunization. The serum was then separated out from the blood and kept at -20 °C until further use. The haemagglutination test for sheep RBC was performed as per procedure. After the HA test, the reciprocal of the highest dilution, which appears to be clear agglutination, was the end titer. Titers were as log 2.

2.2 Cell mediated immune response

The *in vivo* cell-mediated immune response to phytohaemagglutinin type P was determined by the method of Cheng and Lamont (1998) [2]. Phytohaemagglutinin type P elicits immune responses influenced by a subpopulation of 1-helper and T-suppressor cells. An individual that responds better to PHA-P has a higher level of cellular immunity,

influencing T-cell mechanisms that prevent lymphoma formation. Six birds per group were taken to evaluate the response of PHA-P. The procedure was as follows: PHA-P (0.1 mg/ 0.1 ml PBS) was inter-digitally injected between the 3rd and 4th toes of the right shank of the bird. The left leg was chosen as the control and was injected with 0.1 ml PBS. The skin index (foot web index) was calculated as the difference between the swellings (measured by a micrometre instrument) in the right and left legs before and 24 hours after injection.

Foot index FI (mm) = (Post inj.-Pre inj.) - (Post PBS-Pre PBS)

2.3 Statistical analysis

To see the difference between different treatment groups, a one-way analysis of variance was applied (Snedecor and Cochran 1994) [3]. If there is any significant difference in any group, then DMRT is applied (Steel and Torrie 1984) [4].

3. Result

3.1 Cell mediated immunity

The mean cell-mediated immune responses of T₁ T₂ and T₃ are presented in table 4.36 and depicted in Figure 4.36. Non significant effect of immunity was reported among the groups; the immunity value in terms of foot index for T₁, T₂, and T₃ were found to be 0.08±.03, 0.10±.02 and 0.11±.01 respectively.

Age	Local Native	PB-2	Native male X PB2 female (at Farm)	P Value
	0.08±.03	0.10±.02	0.11±.01	NS

3.2 Humoral immunity

Post inoculation	Local Native	PB-2	Native male X PB2 female (at Farm)	P Value
5 th day	4.5±.28 ^a	8.33±1.01 ^b	8.16±.44 ^b	*
14 th day	7.0±0.28 ^a	10.16±0.44 ^b	10.0±0.28 ^b	**
21 day	5.16±0.66	5.50±1.04	6.33±1.20	NS

The mean humoral immune responses of T₁, T₂ and T₃ are presented in table 4.37. In the study of humoral immunity, a 1% sheep RBC solution was inoculated. Immune responses were measured at 5th, 14th and 21th days post-inoculation by the haemagglutination test. In the experiment at 5th day a significant lower immune response was reported in T₁, whereas no statistical difference was found between T₂ and T₃, at 5th day mean titre of T₁, T₂ and T₃ were found as 4.5±.28, 8.33±1.01 and 8.16±.44 respectively. At 14th days, the mean titre of T₁, T₂ and T₃ were found as 7.0±0.28, 10.16±0.44 and 10.0±0.28 respectively. At 5th and 14th day significant lower immune was found in T₁. Whereas T₂ and T₃ were not differed from each other. On 21st day, no significant difference in titre was reported among groups. Mean titre of T₁, T₂ and T₃ were found as 5.16±0.66, 5.50±1.04 and 6.33±1.20 respectively. The decreasing titre values were found in the 21st day.

4. Discussion

Similar to present result Singh and Singh (2004) [5], Chatterjee *et al.* (2007) [6], Divya *et al.* (2018) [7], and Sharma *et al.* (2020) [8] were reported no significant effect on cell mediated immunity among different breeds. Pathak *et al.* (2017) [9] measured higher foot web thickness in aseel. In present study

local native's immune response after SRBC inoculation was reported to be lower as compared to Kadaknath and Aseel (Kundu *et al.*, 1999), Chatterjee *et al.*, 2007) [10, 6], contrary to this lower value reported in Kadaknath birds (Saxena *et al.*, 2012) [11], whereas in the present study the titre of native was similar to findings Radhika *et al.* (2017) [12], Higher values were found in F1 and PB2 as compared to Aseel and Kadaknath (Kundu *et al.*, 1999) [10], in the present study of PB2 the result of immune response is in accordance with Prasad *et al.* (2008) [13] findings in Gramapriya. In the present study immune response value of F₁ crossbreed is in close agreement with Divya *et al.* (2018) [7] findings in Aseel crosses. A similar result was also obtained by Barik *et al.* (2018) [14] in Vanraja. And Alam *et al.* (2021) [15] in NNRIR (progeny of naked neck crossed with RIR) In the present study, local native chickens have less immunity as compared to indigenous breeds Aseel and Kadaknath. The reason might be that these breeds are known for their hardiness and disease resistance; they have developed natural immunity over the generations, which may be stronger than local breeds. In intensive systems, chickens are kept in close proximity and natural behaviours of local chickens, like dust bathing, preening, and foraging, which increase the risk of disease transmission. Local chickens may not have developed

immunity to the specific pathogens present in intensive settings; constant exposure to pathogens and intensive environmental stress make their immune systems weak. In the study of cross-breed chickens, higher immunity was reported. The reasons might be hybrid vigour, genetic diversity and complementary gene combinations. The colour broiler shows more immunity because it may have greater genetic diversity compared to the commonly used white-feathered variety. Selective breeding is also a reason for better immunity.

5. Conclusion

In the present study under intensive system humoral immune response was found better in F₁ crossbred and PB₂ whereas lower immunity response obtained in local native because native chicken of Chhattisgarh is less immune against pathogen found in intensive system, whereas antibody titre was reported declining trend after 14th day post injection of sheep RBC.

6. Acknowledgement

The facilities provided by the Vice-Chancellor, the Dean, College of Veterinary Science and A.H., Anjora, DSVCKV, Durg (C.G.) and Directorate of Poultry Research, Rajendranagar, Hyderabad are sincerely acknowledged.

7. Reference

- Rajkumar U, Reddy MR, Rama Rao SV, Radhika K, Shanmug M. Evaluation of Growth, Carcass, Immune Response and Stress Parameters in Naked Neck Chicken and Their Normal Siblings under Tropical Winter and Summer Temperatures. *Asian-Aust. J Anim. Sci.* 2011;24(4):509-516.
- Cheng S, Lamont SJ. Genetic analysis of immunocompetence measures in a White Leghorn chicken line. *Poult. Sci.* 1998;67:989-995.
- Snedecor GW, Cochran WG. *Statistical Methods*, 8th edn. Iowa State University Press, Ames, Iowa, USA; c1994.
- Steel RGD, Torrie JH. *Principles and Procedures of Statistics: A Biometrical Approach*, 2nd Edn. McGraw Hill International Book Co.; c1981. p. 173-175.
- Singh RV, Singh DP. Possibilities of exploitation of indigenous poultry germplasm. Paper presented in National Symposium on Livestock biodiversity vis-à-vis resource exploitation: An introspection, 11-12 February 2004, held at NBAGR, Karnal, India; c2004. p. 21-30.
- Chatterjee RN, Sharma RP, Reddy MR, Niranjana M, Reddy BLN. Growth, body conformation and immune responsiveness in two Indian native chicken breeds. *Livest. Res. Rural. Dev.* 2007;19(10):37.
- Divya D, Viroji ST, Rao M, Gnana P, Narasimha J. Immunocompetency of two chicken backyard variety with 25% Aseel inheritance. *J Pharm. Innov.* 2018;7(2):242-245.
- Sharma A, Saini S, Sharma P, Mahala S, Bhat K, Awasthi P. Comparative evaluation of immune-responsiveness in indigenous and exotic breeds of chicken. *entomol. zool. Stud.* 2020;8:545-548.
- Pathak P, Dubey PP, Dash SK, Deka D. Comparative evaluation of growth, carcass and immune responsiveness traits in native chickens breeds of India. *Int. J. Pure Appl. Biosci.* 2017;5(2):612-620.
- Kundu A, Singh DP, Mohapatra SC, Dash BB, Moudgal RP, Bisht GS. Antibody response to sheep erythrocytes in Indian native vis-à-vis imported breeds of chickens. *Br. Poult. Sci.* 1999;40:40-43.
- Saxena R, Stephanb R, Mishra S, Shukla S, Saxena DP, Pratap SO. Assessment of Immunocompetence Status of Native Breed of Chickens. *Biomed. Pharmacol. J.* 2012;5:285-293.
- Radhika R, Thyagarajan D, Veeramani P, Karthickeyan SMK. Aseel, Kadaknath and White Leghorn Chicken Immune Response to Variation in Sheep Red Blood Cell. *Int. J Pure App. Biosci.* 2007;5(5):335-340.
- Prasad AR, Prakash MG, Rajkumar U, Mahendar M, Sagar NG. Evaluation of Immune Response in Gramapriya Chicken, A Synthetic Variety, *Int. J Pure App. Biosci.* 2018;6(2):65-68.
- Barik S, Swain, RK, Sethy K, Mishra SK, Satapathy DP, Panigrahy KK, *et al.* Comparative Evaluation of Blood Biochemical and Haematological Parameters Along With Immune Status of Vanaraja Birds under Different Systems of Rearing. *Int. J Curr. Microbiol. Appl. Sci.* 2018;7:872-878.
- Alam M, Chand N, Khan S, Suhail SM. Growth performance, proximate composition and immune competence of naked neck, Rhode Island Red and their F1 crossbred chickens in a tropical climate. *J Anim. Health Prod.* 2021;9(3):303-311.