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Evaluation of Immune Response in *Gramapriya* Chicken, A Synthetic Variety

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ABSTRACT

The immune competence and disease resistance in Gramapriya, a rural poultry germplasm at 6 weeks age were studied. The sheep red blood cells and New-castle disease virus were used as T dependent antigen to quantify the antibody response and in-vivo mitogen PHA-P to quantify the lymph proliferative cell-mediated immune response. Between both the sexes, a significant ($P \leq 0.01$) difference was observed with respect to cell mediated immunity to PHA-P with the overall mean value of 0.75 ± 0.07 mm. Whereas, no significant difference was found between males and females in humoral immune response against sheep RBC and Newcastle Disease Virus vaccine with overall mean titre values of 6.57 ± 0.41 and 4.47 ± 0.17 for SRBC and NDV titres (log_2 values), respectively.

Key words: *Disease resistance, Immune competence, Newvastle Disease Virus vaccine, PHA-P, Sheep RBC*

INTRODUCTION

Importance of backyard poultry production in rural and tribal areas has been globally recognized to overcome the problems of poverty, hunger and malnutrition. However, realizing the importance of backyard poultry, Directorate of Poultry Research, Hyderabad successfully developed a synthetic dual purpose chicken *Gramapriya*, which can cater to the need of germplasm in these areas. In addition, resistance to diseases is an important attribute of sustainable poultry production and it is under polygenic control. The development of general disease resistance through indirect selection based on immune-competence has been suggested to be a long term strategy. There are several traits which can be considered for improving genetic resistance to disease in poultry. The antibody response to sheep red blood cells (SRBCs) indicates the ability of a bird to produce antibodies[12].

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In this regard, immune response to a natural, non-specific, non-pathogenic and multi-determinant antigen like sheep red blood cells (SRBC) is widely used to study the immune competence in poultry[17]. The indicator traits for humoral and cell mediated immune (CMI) responses like response to SRBC, New Castle Disease Virus vaccine (NDV) and Phytohemagglutinin-P (PHA-P) have been measured for assessing immune response capabilities. Further, incorporation of genetic resistance enhances the capacity of the bird to show resistance to disease and also enhances immune response to vaccines.

MATERIAL AND METHODS

Randomly selected forty birds (twenty of each sex) of *Gramapriya*, an improved backyard variety, maintained at Directorate of Poultry Research, Hyderabad were used to determine humoral immune response against SRBC and NDV vaccine and *in vivo* cell-mediated immune response to mitogen PHA-P (at 6 weeks of age).

Antibody response to sheep red blood cells (SRBC)

The *in vivo* response to SRBCs was determined by injecting 1 mL of 1% SRBCs suspension in Phosphate Buffered Saline (PBS, pH 7.2) to each bird (at 6 weeks of age), intravenously. Further, the immune sera were collected on 5 dpi (days post immunization). The antibody titers were determined by means of haemagglutination (HA) test and expressed in $\log_2$ values for the reciprocal of the highest titre where complete agglutination was observed[12].

Antibody response to Newcastle Disease Virus (NDV)

Chicks were vaccinated against ND by ocular route on 7th and 28th day of age with *Lasota* strain. The blood samples were collected from the birds at 6 weeks of age and the antibody titre against NDV was determined by Haemagglutination inhibition assay (HI) using 4 HA units of NDV. The highest dilution where complete inhibition of agglutination occurred was recorded and expressed in $\log_2$ values[15].

Cell mediated immune response to PHA-P

The CMI response was measured as *in vivo* response to a T-cell mitogen, PHA-P. Each bird (at 6 weeks of age) was injected with 0.1 mg of PHA-P dissolved in 0.1 mL of sterile PBS intra-dermally into the left wattle of the birds. The right wattle served as control which receives 0.1 mL of sterile PBS only. Further, the pre and 24 hours post - injection wattle thickness was measured in millimeters using a constant tension gauge (Mitutoyo, Japan) as described by Corrier and De Loach[3]. The index was calculated as the difference in the increase of thickness of wattle from 0 to 24 hours in the mitogen injected and control wattles.

Statistical analysis

The data obtained in the study was subjected to student t-test to comapare the immune response between both the sexes.

RESULTS AND DISCUSSION

Humoral immune response

Humoral immune response was measured as response to SRBC at 5th day post inoculation. The mean titre values were 6.57 ± 0.41 and 4.47 ± 0.17 for SRBC and NDV titres (expressed as $\log_2$ values), respectively. Further, no significant difference was found in the immune response to SRBC and NDV between males and females.

The present findings were similar with the findings of Chattopadhyay *et al*[2], Rajkumar *et al*[8], Rao *et al*[10], and Tomar *et al*[16]. However, present findings with respect to SRBC were higher than those reported by various authors[11,13,4,7,14]. in *Gramapriya*, *Vanaraja*, *Krishibro*, WLH, Kadaknath, Naked neck (NaNa) and Aseel.

The mean HI titre against NDV, obtained in the present study was lower than that reported by Jayalaxmi *et al.*[5,6]. but was higher than that reported by Rajkumar *et al.*[7], in Naked neck genotypes. The differences could be due to differences in genetics, age and management.

Cell mediated immunity

Highly significant ($P \leq 0.01$) difference was found between both the sexes was found with respect to CMI response to PHA-P and the

mean increase in wattle thickness was 0.75 ± 0.07 mm. Among sexes females were showed significantly higher response to PHA-P compared to males. The present findings are comparable with the reports of Chatterjee *et al.*[1], in Aseel and Kadaknath and Rajkumar *et al.*[9], in Dwarf chicken. However, higher values were also reported by Rajkumar *et al.*[7,8], in Naked neck genotypes and by Rao *et al.*[10], in Rajasree birds.

Variations in the immune competence traits might be due to differences in genetic makeup of the different stocks and other factors such as differences in feeding, management, environment and age at the time of estimation of the traits. It has been suggested that immune competence traits should be combined while selecting for improvement for general immune responsiveness[17].

It is concluded that improvement for general immune competence profile of the birds could be achieved either by selection for response to sheep red blood cells or for combination of different facets of host's immune system.

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