

Performance and Humoral Immune Response to Newcastle Disease in Two Strains of Broiler Chickens

¹Gh. Dashab, ²Gh. Sadeghi and ¹M. Mehri

¹University of Zabol, Zabol, Iran

²University of Kurdistan, Kurdistan, Iran

Abstract: A total of 600 one-day old broiler chicks of two commercial breeds were used in a CRD design to compare performance and humoral immune response to Newcastle disease. Body weight and feed intake were measured weekly and at 42 day of age ten chicks were chosen randomly from each pen and slaughtered to determination of carcass characteristics. On vaccination day, 10 chickens selected randomly and were wing banded to monitor the antibody titer trend. There was no significant difference in body weight between studied strains. No significant difference was observed in feed intake and feed conversion ration between Arian and Lohman chicks. Lohman chicks had greater carcass weight and percentage than Arian. Abdominal fat weight was significantly ($p < 0.05$) higher in Lohman than Arian chicks. In both strains the antibody production increased by increasing the days after vaccination. In Arian chicks the increase was more pronounceable at 10 days after vaccination but Lohman chicks had highest antibody production at 15 days after vaccination. Strain effect was observed only at 10 day after vaccination and Lohman chicks showed greater antibody production against NDV vaccine than Arian ($p < 0.05$). It could be concluded from results that Arian and Lohman chicks has similar performance, but they show different immune response to NDV vaccine.

Key words: Arian, lohman, immune response, performance

INTRODUCTION

Avian infection diseases are costly for poultry industry. So increase management costs and raises human concern. In recent decades, genetic improvement of commercial poultry is being undertaken by only a few breeding organizations. Poultry production occurs under a variety of climatic and production management conditions throughout the world. It is desirable, therefore, to develop stocks that possess general rather than specific resistance to stress factors such as disease. Today's broiler has selected intensely for rapid growth rate and show less antibody response to Sheep Red Blood Cell (SRBC) antigen and higher mortality than the broiler of 1957 (Qureshi and Havenstein, 1994). Its resistance to stressors has also been compromised (Cahaner *et al.*, 1998). An adjunct in controlling avian disease is the development of strains of chickens that are resistance to disease. Several criteria have to be considered for assessing the immune status of a stock for breeding programs (Boa-Amponsem *et al.*, 1999). The heritability of antibody titer at 3, 7, 10 and 13 day after Newcastle vaccination varies between 0.2 and 0.5 in white leghorn chicks (Cheng *et al.*, 1991; Cole and Hutt, 1961). Puthongsiriporn and Scheideler showed a strain effect

on antibody production against IBD virus in two strains of leghorn pullet chicks. There are very little studies to evaluate the immune response of Lohman and Arian chicks to vaccination. The current study was carried out to compare the antibody titer in two different strains of broiler chickens.

MATERIALS AND METHODS

A total of 600 one-day old broiler chicks of two commercial breeds were placed in 8 pens, 75 per each. The commercial strains were Arian and Lohman. The diets were formulated to meet nutrient requirements according to NRC. Feed and water were provided *ad libitum*. Broilers were weighed weekly and weight gains were calculated. Feed intake was determined weekly and adjusted for mortality. Feed conversion ratios were calculated. At 42 day of age ten chicks were chosen randomly from each pen, killed and abdominal fat pad and carcass were weighed and expressed as a percentage of live body weight.

The chicken were immunized against Newcastle Disease (ND, B₁, day 7, eye drop), leaving them for natural contamination and immunization by existing subtypes. On vaccination day, 10 chickens selected randomly and

were wing banded (each with a unique number) to monitor the antibody titer trend. Blood samples were collected via wing vein from wing banded chicks on days 5, 10 and 15 after vaccination. The separated serums by centrifugation (3000 rpm, 10 min) were used for antibody titration against Newcastle virus by standard procedures of Enzyme-Linked Immunosorbent Assay (ELISA).

The results obtained from the experiment were analyzed by an analysis of variance using the General Linear Model (GLM) procedure of SAS and means were compared by Duncan's Multiple Range Test (SAS Institute, 1995).

RESULTS AND DISCUSSION

Live performance: there was no significant difference in body weight between studied strains (Table 1). At 21 and 30 days of age Arian chicks had higher body weight numerically, but at market age (42 days) the body weight of Lohman chicks was higher. These finding shows that Arian chicks grow faster in early ages and at late stages Lohman chicks grow more rapidly and compensate the delayed growth.

No significant difference was observed in feed intake between Arian and Lohman chicks (Table 1), but at all ages, the Arian chicks consumed more feed numerically.

The calculated feed conversion ratio in both Arian and Lohman broiler chicks have shown in Table 1. There was no significant difference in feed conversion, but Arian chicks had higher feed conversion ratio at 30 and 42 days of age numerically. These results in feed conversion ratio are completely coincident with feed intake and live body weight. There are no comparative studies on performance of Arian and Lohman in literatures. However, the data that achieved for live performance of Arian chicks is comparable to those reported by Sadeghi *et al.* (2004).

Carcass characteristics: Carcass and abdominal fat weight and percentage are shown in Table 2. There was no significant difference in carcass weight and percentage between strains, but Lohman chicks had greater carcass weight and percentage than Arian. Abdominal fat weight was significantly ($p<0.05$) higher in Lohman than Arian chicks and when abdominal fat presented as a percentage of body weight, this different was not significant.

Antibody titer: Antibody production against Newcastle Disease Virus (NDV) vaccine has shown in Table 3. In both strains the antibody production increased by increasing the days after vaccination. The antibody production trend was different in strains. In Arian chicks

Table 1: Performance of lohman and arian broiler chickens at 21, 30 and 42 days of age

Strain	Body weight (g)			Feed intake (g)			Feed conversion		
	21d	30d	42d	21d	30d	42d	21d	30d	42d
Lohman	816	1477	2124	1351	2359	5253	1.65	1.60	2.49
Arian	860	1535	2030	1399	3012	5504	1.62	1.95	2.69
SEM	12	23	32.77	46.92	76.88	506.01	0.054	0.111	0.247

^{a-c}-Values with no common following letter in each column differ significantly ($p<0.05$)

Table 2: Carcass characteristics of lohman and arian broiler chickens at age 42

Strain	Carcass weight		Abdominal fat	
	g	(%)	g	(%)
Lohman	1623	76	39.0a	1.83
Arian	1542	74	29.7b	1.31
SEM	26.3	0.012	1.65	0.16

^{a-b}-Values with no common following letter in each column differ significantly ($p<0.05$)

Table 3: Antibody production against Newcastle Disease Virus (NDV) vaccine using ELISA test in Lohman and Arian chicks at 5, 10 and 15 days after vaccination

Strain	Days after vaccination		
	5	10	15
Lohman	0.216	0.232b	0.335
Arian	0.233	0.312a	0.313
SEM	0.017	0.018	0.022

¹Absorbance unit (Optical Density; OD) read by a microtiter plate reader at 650 nm, ^{a-b}-Values with no common following letter in each column differ significantly ($p<0.05$)

the increase was more pronounceable at 10 days after vaccination and there was no big change in antibody production from 10 to 15 days after vaccination. Lohman chicks had highest antibody production at 15 days after vaccination and a big increase happened from 10 to 15 days after vaccination. Strain effect was observed only at 10 day after vaccination and Lohman chicks showed greater antibody production against NDV vaccine than Arian ($p<0.05$). This may be because of different fatty acid composition of bursa of Fabricius tissue in these strains. Probably the bursa of Fabricius in Arian strain contains more fatty acids that are precursor for PGE₂, such as arachidonic acid, resulting in suppression of antibody production. Puthongsiriporn and Scheideler compared antibody production in two strains of Leghorn pullet chicks and showed strain effect on antibody production against NDV vaccine in 12 week of age. They discussed that higher level of arachidonic acid in the bursa of Fabricius of Hy-Line brown pullets may have induced high production of PG₂E resulting in suppression of antibody production.

Our findings are in contrast with Zulkifli *et al.* (2000) that showed antibody production against Newcastle disease vaccine on d 21 was not affected by strain in broiler chickens.

CONCLUSION

It could be concluded from our findings that Arian and Lohman chicks has similar live performance, but those carcass characteristics are different. Also, the antibody production trend against NDV vaccine is different in these strains and Lohman chicks keep higher antibody titer for longer time.

REFERENCES

- Boa-Amponsem, K., C.T. Larsen, E.A. Dunnington and P.B. Segel, 1999. Immunocompetence and resistance to marble spleen disease of broiler and layer type pure lines of chickens. *Avian Pathol.*, 28: 379-384.
- Canhner, A., N. Deeb, R. Yunis and Y. Lave, 1998. Reduced stress tolerance in fast growing broilers. *Proceedings of the WPSA 10th European Poultry Conference, Jerusalem*, 1: 113-117.
- Cheng, S., M.F. Rothschild and S.J. lamont, 1991. Estimates of quantities parameters of immunological traits in the chicken. *Poul. Sci.*, 70: 2023-2027.
- Cole, R.K. and F.B. Hutt, 1961. Genetic differences in resistance to Newcastle disease. *Avian Dis.*, 5: 205-214.
- Duncan, D.B., 1955. Multiple ranges and multiple F test. *Biometric*, 11: 1- 42.
- Qureshi, M.A. and G.B. Havenstein, 1994. A comparison of the immune performance of a 1991 commercial broiler with a 1957 random bred strain when fed "Typical" 1957 and 1991 diets. *Poul. Sci.*, 73: 1805-1812.
- Sadeghi, Gh., A. Samie, J. Pourreza and H.R. Rahmani, 2004. Canavanine content and toxicity of raw and treated Bitter Vetch (*Vicia ervilia*) seeds for broiler chicken. *Int. J. Poul. Sci.*, 3: 522-529.
- SAS Institute, 2001. SAS User's Guide: Statistic. Version 8.2, SAS institute Inc., Cary, NC, USA.
- Zulkifli, L., N. Abdullah, N. Mohd. Azrin, Y.W. Ho, 2000. Growth performance and immune response of two commercial broiler strains fed diets containing *Lactobacillus* cultures and oxytetracycline under heat stress conditions. *Br. Poul. Sci.*, 41: 593-597.