

DIETARY SUPPLEMENTATION OF ORGANIC CHROMIUM ON IMMUNE STATUS OF BROILERS AGAINST INFECTIOUS BURSAL DISEASE

Anandhi, M.^{1*}, Poorani, K.², Jyothi Priya R.³ and Mathivanan, R.⁴

^{1,3}Assistant Professor, ²SRF

College of Poultry Production and Management, Mathigiri, Hosur- 635110

⁴Professor, ILFC, Tirunelveli

E-mail: dranandhim@gmail.com (*Corresponding Author)

Abstract: An experiment was conducted on broilers for a period of 6 weeks with one hundred and twenty eight commercial, straight run day- old- chicks to study the influence of dietary organic chromium on immunity towards IBD infection. The treatment group consisted of basal diets (T₁), 250 (T₂), 500 (T₃) and 750 (T₄) µg organic chromium per kg basal diet. Immunity against IBD was assessed by Quantitative agar gel precipitation test (QAGPT). The geometric mean titre (GMT) value were recorded high in birds supplemented with 500 µg organic chromium per kg diet (T₃), followed by T₂ and T₄ groups. The mean titre values were recorded high in T₃ and T₄ groups, followed by T₂ group. Control group recorded the lowest titre values. The results revealed that organic chromium supplementation significantly (P< 0.01) improved the QAGPT titre against IBD.

Keywords: Chromium, GMT, IBD, QAGPT, titre.

Introduction

Chromium (Cr) had been considered as an essential micronutrient for animals by nutritionists. The primary role of Cr in metabolism was enhancing the glucose uptake by the cells. Even though Cr was not currently considered as an essential trace mineral for poultry, research data provide evidence for its nutritional and physiological role as a micronutrient. The beneficial effects of Cr could be observed more efficiently under environmental, dietary and hormonal stresses (Eze *et al.*, 2014).

Infectious bursal disease virus (IBDV) was one of the economically most important diseases that affects commercially produced chickens worldwide. Along with strict hygienic management of poultry farms, vaccination programmes with inactivated and live attenuated viruses were used to prevent IBD. However, maternally derived IBDV-specific antibodies may interfere with early vaccination with live vaccines. Thus new technologies and second-generation vaccines including rationally designed and subunit vaccines had been developed (Muller *et al.*, 2012).

The present study was carried out to find the beneficial effects of organic chromium on dietary supplementation to enhance the immune response against Infectious Bursal Disease in broilers.

Material and methods

One hundred and twenty eight commercial, straight run day-old broiler chicks belonging to single hatch were randomly allotted into four treatment groups of basal diet (T₁), 250 (T₂), 500 (T₃) and 750 (T₄) µg organic chromium per kg basal diet, with four replicates of eight birds each for six weeks period under standard managemental conditions.

The serum samples from different groups were utilized for quantifying the antibody level.

Agar 1.2 g in 100 ml hypertonic saline was dissolved and boiled. Sodium azide was added at a final concentration of 0.02 per cent to prevent fungal contamination while hot, cooled to 50°C to 55°C and then cast approximately 5 ml on the clean, grease free slide and allowed for solidification.

The assessment of IBD antibody level was carried out by quantitative agar gel precipitation test (QAGPT) as per the method described by Wood *et al.* (1979) with slight modification. After solidification, satellite well pattern of six wells surrounding one central well of 5 mm diameter with an inter-space 0.3 mm were punched out. On each slide, two sets of such patterns were punched out and number given to the peripheral wells from 1 to 12. The two central wells were loaded with reference IBDV antigen. The wells 6 and 7 were kept as known negative and known positive control, respectively. The first peripheral well was filled with neat serum. In the remaining wells serial two fold dilutions of the test serum was added from the neat serum. The loaded slides were incubated at 37°C for 24- 28 hrs in a humid chamber. The reciprocal of the highest dilution of serum showing precipitin line was taken as the QAGPT titre of the serum.

Result

Blood samples were collected randomly from eight birds in each treatment group prior to immunization and 5 days after immunization with IBD vaccine. The serum samples were utilized for quantifying the antibody level in serum. Immunity against IBD was assessed using QAGPT and was interpreted in Table 1.

The QAGPT mean titre was found to be 5.0 in both T₃ and T₄ groups. The titre was 2.0 in the control group. The result showed that the titre level increased as the level of chromium in the diet increased. However, the 500 µg and 750 µg of chromium supplementation in diet revealed no significant difference.

The geometric mean titre (GMT) values revealed high at T₃ group, where 500 µg of organic chromium was supplemented, followed by T₄ and T₂ group. When compared to the GMT values of control group, it also revealed the organic chromium supplementation enhanced the antibody response against IBD.

The log₂ titre values was also high in T₃ (2.25), followed by T₄ (2.0) and T₂ (2.0). Control group showed log₂ titre value of 1.0.

The difference between T₄ and T₁ groups were significantly higher (P < 0.01), and no significant difference was noticed between the treatment groups.

Discussion

Our study revealed that increased in chromium supplementation enhanced the antibody titre. This may be due to reduced concentration of corticosteroids in the serum when chromium (III) was given at proper dose, which may enhance antibody production (Mowat, 1993). This finding is in agreement with Uyanik *et al.* (2000) who observed that the total antibodies, IgG and IgM titres were increased by chromium supplementation while increasing the cell-mediated immune response.

Lee *et al.* (2003) concluded that chromium supplementation at 400 ppb significantly (P < 0.05) increased the antibody titre at 6 weeks of age in broilers.

Li *et al.* (2004) found that dietary inclusion of organic chromium enhanced the cell mediated and humoral immune response in heat stressed layers.

The present study revealed that organic chromium supplementation significantly (P < 0.01) improved the antibody titre against IBD.

References

- [1] Eze, D.C., Okwor, E.C., Anike, W.U., Kazeem, H.M. and Majiyagbe, K.A. 2014. Effect of chromium propionate on the humoral immune response and performance of broilers vaccinated against Newcastle disease in the tropics. *J. Anim. Plt. Sci.* **24**: 1709- 1715.
- [2] Lee, D.N., Wu, F.Y., Cheng, Y.H., Lin, R.S. and Wu, P.C. 2003. Effects of dietary chromium picolinate supplementation on growth performance and immune response of broilers. *Asian – Aust. J. Anim. Sci.* **16**: 227- 233.
- [3] Li, S.H., Wang, J., Zheng, Y.M., Xu, W.X., Jin, G. M. and Dong, H. 2004. Effect of chromium on the organization and structure of spleen of heat stressed layers. *Chinese J. Vet. Sci.* **24**: 71- 74. (*Poult. Abstr.*, 2004. **30**: 2288).
- [4] Mowat, D. N. 1993. Chelated chromium for stressed feeder calves. *Can. J. Anim. Sci.* **73**: 49-55.

- [5] Muller, H. Mundt, E., Etteradossi, N. and Islam, M.r. 2012. Current status of vaccines against Infectious Bursal Disease. **41**: 133- 139.
- [6] Uyanik, E., Atasever, A., Ozdamar, S. and Aydin, F. 2000. Effect of dietary chromium chloride supplementation on performance, some serum parameters and immune response in broilers. *Biological Trace Element Res.* **90**: 99- 115 (*Poult. Abstr.*, 2003. **29**: 1452)
- [7] Wood, G.W., Muskett, J.C., Hebert, C.N. and Thronton, D.H. 1979. Standarization of the quantitative agar gel precipitin test for antibodies to Infectious Bursal Disease. *J. Biol. Std.* **7**: 89- 96.

Table I: Mean value of QAGPT titre against Infectious Bursal Disease as influenced by dietary inclusion of organic chromium in broilers

QAGPT titre	No. of samples			
	T ₁	T ₂	T ₃	T ₄
0	1	-	-	-
2	2	1	-	2
4	1	2	3	-
8	-	1	1	2
Mean titre	2.0	4.5	5.0	5.0
GMT	2.0	4.0	4.9	4.0