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Research Article

EFFECT OF SPIRULINA ON GROWTH AND BURSAL INDEX OF INFECTIOUS BURSAL DISEASE VACCINATED CHICKENS

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ABSTRACT

Infectious bursal disease (IBD) vaccination leads to varying levels of immunosuppression which increases the bird's vulnerability to various infections. The present study was conducted to observe the effect of Spirulina feeding on growth and bursal index of IBD vaccinated broiler chickens. One hundred and two chicks were procured and reared in experimental house of the department. At the age of 10 days, chicks were divided randomly into four groups (groups A (33), B (27), C (21) and D (21) having different number of chicks. From 10 to 20 days, feed of all the chicks of group B and D was supplemented with probiotic Spirulina at the dose rate of 1.0 % of feed. All the chicks of group C and D were vaccinated with IBDV intermediate plus strain vaccine at the age of 17 days. Chicks in group C showed mild dullness, depression, anorexia with reduced feed and water intake. Whitish coloured diarrhoea was also observed in few chicks at 7 and 14 day post vaccination. However, in group D chicks above mentioned clinical signs were observed only in 1-2 chicks throughout the experiment. Mean body weight in group B was found to be significantly higher while in group C, it was significantly lower than other groups. It indicated that Spirulina helped in growth of chickens and may act as a growth promoter. There was significant reduction in bursal index due to IBD vaccination in broiler chickens. Spirulina was able to significantly increase the bursal index in IBD vaccinated chickens. It indicated that Spirulina might be able to reduce the immunosuppression caused by IBD vaccine if given at the rate of 1% through feed from 10 to 20 days of age along with IBD vaccine.

Key words: Broiler chickens, Bursal index, Infectious bursal disease vaccine

Infectious bursal disease (IBD) commonly known as Gumboro disease is one of the important diseases in chickens which needs control. A number of IBD vaccination strategies have been applied in the field and new generation IBD vaccines (vector and complex vaccines) are available in the market (Muller *et al.*, 2012) but vaccination failure due to appearance of variant or newer strains of the virus in the recent times has also been reported (Moemen *et al.*, 2014). Moreover, various attenuation levels of commercially available live vaccines for IBD lead to varying levels of immunosuppression, increasing the bird's vulnerability to various infections. A study on immunosuppressive effect of vaccination against infectious bursal disease indicated bursal damage after vaccination (Samanta *et al.*, 2011). Narang and Pruthi. (2009) also reported significant reduction in the bursal index due to IBD vaccination indicating immunosuppression.

Spirulina is rich in essential amino acids, minerals and essential fatty acids (Somchit *et al.*, 2014). Spirulina has been reported to have numerous health benefits, including antioxidant, immunomodulatory, anti-inflammatory, anticancer, anti-viral and anti-bacterial activity due to presence of phycocyanin and beta-carotene (Hoseini *et al.*, 2013). However, no such report regarding the interaction of Spirulina with IBD or its vaccine could be traced in the literature. Keeping in view the above facts, the present study was planned to study the effect of Spirulina feeding on growth and bursal index of IBD vaccinated chickens.

MATERIALS AND METHOD

One hundred and two (102), day old, apparently healthy and unvaccinated broiler chicks were procured from a local hatchery and reared in the departmental animal house under strict hygienic condition. At the age of 10 days, chicks were divided randomly into four groups (groups A, B, C and D) having different number of chicks as detailed in the table 1. From 10 to 20 days, feed of all the chicks of group B and D was supplemented with probiotic Spirulina at the dose rate of 1% of feed (i.e. 1 g/ 100 gm of feed), whereas all chicks of group A and C were given feed without any Spirulina supplementation. All the chicks of group C and D were vaccinated with IBDV intermediate plus strain vaccine (M.B. strain) at the age of 17 days, whereas no vaccine was given to the chicks of groups A and B. All the chicks belonging to each group were examined daily for any clinical signs. Body weight and weight of bursa of Fabricius was measured from six chicks of different groups at different days of age (DOA) as mentioned in table 1. Bursal index was calculated on day 10th, 17th, 24th, 31st and 38th day of age by following formula:

$$\text{Bursal index} = \frac{\text{Weight of bursa}}{\text{Body weight}} \times 1000$$

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Table 1
Experimental Design

Groups (number of birds)	Treatment	Day of age (DOA) for sampling
A(33)	Control	10, 17, 24, 31, 38 doa
B(27)	Spirulina (10-20 doa)	17, 24, 31, 38 doa
C(21)	Vaccination alone	24, 31, 38 doa
D(21)	Spirulina (10-20 doa) + Vaccination (at 17 doa)	24, 31, 38 doa

The data for various parameters were subjected to statistical analysis using analysis of variance technique through Posthoc-Duncan LSD Alpha (0.05).

RESULTS AND DISCUSSION

Clinical signs

No clinical signs were observed in any chick in the control (Group A) and Spirulina fed group (group B) throughout the experiment. Before giving IBDV vaccination, no clinical signs were observed in any chicks in both the vaccinated groups (group C and D). However, mild clinical signs were observed in some of the broiler chicks after vaccination with intermediate plus strain of IBDV in vaccinated groups. Chicks in group C (IBDV vaccinated) showed mild dullness, depression, anorexia with reduced feed and water intake. Whitish coloured diarrhoea was also observed in few chicks at 7 and 14 day post vaccination (DPV). However, in group D chicks (vaccinated and Spirulina fed) above mentioned clinical signs were milder in nature and were also observed only in 1-2 chicks throughout the experiment. No mortality was observed in any of the experimental groups throughout the experiment.

Body weight

Mean body weights of chicks in different experimental groups at different intervals are presented in table 2 and depicted in figure 1. Mean body weight in Spirulina fed group (group B) was found to be significantly ($P \leq 0.05$) higher till 14 DPV/31 DOA as compared to control group chicks and it was comparable at 21DPV/38 DOA in both the groups. In the IBDV vaccinated group (group C) chicks, mean body weight was found to be significantly ($P \leq 0.05$) lower as compared to control group throughout the experiment. IBDV vaccination in chicks of group D also led to lesser body weight at all the intervals as compared to control group A but this was significant ($P \leq 0.05$) at 21DPV only. Amongst vaccinated groups (group C and D), mean body weight was found to be significantly ($P \leq 0.05$) higher in group D (IBDV vaccinated with Spirulina fed) only at 7 DPV/24 DOA and it was almost equal to control group chicks. Thereafter non-significant higher mean body weight was observed in group D. It indicated that Spirulina helped in growth of chickens and may act as a growth promoter. Naseem *et al.* (2012) studied the growth promoting effect of a probiotic supplementation in the feed of broiler chickens vaccinated against infectious bursal disease. When compared with control group, the probiotic supplemented chickens had better feed conversion ratio (FCR) (1.938 and 1.959), with significantly heavier live body weight, respectively. Shanmugapriya *et al.* (2015) concluded that 1% of Spirulina platensis supplementation significantly increases body weight gain. Kaoud (2015) found that the prebiotic and Spirulina platensis supplementation significantly increased body weight and decreased feed gain ratios/ feed conversion ratios and decreased the mortality in broilers. Yusuf *et al.* (2016) also reported that 1 or 2 g Spirulina/kg vegetarian diet may enhance parameter of growth performance without obvious effect on both meat quality and gut microbiota. While in another study conducted by Mirzaie *et al.* (2018) concluded that Spirulina supplement had no significant effect on weight gain, feed intake and FCR at weekly recording during 17 to 38 days of age.

Table 2
Mean body weight (g) of broiler chicks in different experimental groups at different intervals (Mean ± S.E.)

Groups	Mean value of Body weight of broiler chicks in grams (g)			
	Days of age (DOA)/Days Post vaccination (DPV)			
	17 DOA/ 0 DPV	24 DOA/ 7 DPV	31 DOA/ 14 DPV	38 DOA/ 21 DPV
A	593.4^{a} ±25.11	1003.2^{b} ±6.95	1550.0^{b} ±11.51	2310.0^{b} ±25.09
B	685.7^{b} ±22.85	1173.7^{c} ±13.27	1670.0^{c} ±8.76	2328.5^{b} ±33.91
C	-	965.3^{a} ±7.34	1510.0^{a} ±15.80	2127.5^{a} ±35.26
D	-	1001.0^{b} ±12.07	1530.0^{ab} ±18.79	2168.3^{a} ±17.06

Means with different superscript in the column differ significantly ($P \leq 0.05$)

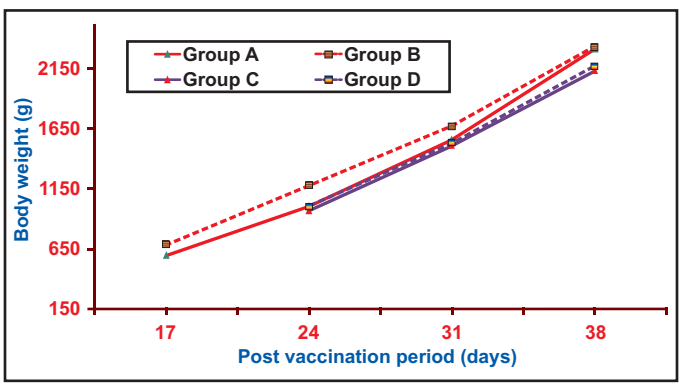

Fig. 1

Bursal index

Bursal index reflects the relative changes in weight of bursa of Fabricius with respect to body weight. Mean bursal index of chicks in different experimental groups at different intervals are presented in table 3 and depicted in figure 2. Mean bursal index was found to be significantly ($P \leq 0.05$) higher in Spirulina fed chicks (group B) as compared to control group chicks except at 14 DPV/31 DOA where it was non-significant. In IBDV vaccinated chicks (group C), there was significant ($P \leq 0.05$) decrease in bursal index throughout the experiment as compared to control group chicks. IBDV vaccination in chicks of group D also led to decrease in bursal index throughout the experiment as compared to chicks of group A, however, this decrease was significant only at 7 DPV/24 DOA. Amongst vaccinated groups (group C and D), the mean bursal index was significantly ($P \leq 0.05$) higher in group D chicks (IBDV vaccinated with Spirulina fed) on 7 DPV and 21 DPV. The increase in bursal index in group D was observed throughout the experiment and values were almost equal to control group chicks at 14 and 21 DPV. The decrease in the bursal index in IBD vaccinated birds during the present study was supported by the sequential microscopic changes observed in bursa of Fabricius. Thangavelu *et al.* (1998) reported a significant reduction in bursa: body weight indexes due to various IBD vaccines used in India. Reduction in bursal index was more in case of intermediate vaccines as compared to mild vaccines.

Table 3
Mean value of bursal index of broiler chicks in different experimental groups at different intervals (Mean ± S.E.)

Groups	Mean value of bursal index of broiler chicks			
	Days of age (DOA) / Days Post vaccination (DPV)			
	17 DOA/ 0 DPV	24 DOA/ 7 DPV	31 DOA/ 14 DPV	38 DOA/ 21 DPV
A	2.53^{a}±0.17	2.31^{c}±0.02	0.86^{b} ±0.03	0.58^{b}±0.01
B	3.00^{b}±0.12	2.96^{d}±0.06	0.89^{b} ±0.10	0.84^{c}±0.02
C	-	1.92^{a} ±0.04	0.76^{a} ±0.08	0.46^{a}±0.01
D	-	2.08^{b}±0.04	0.80^{ab} ±0.05	0.60^{b}±0.03

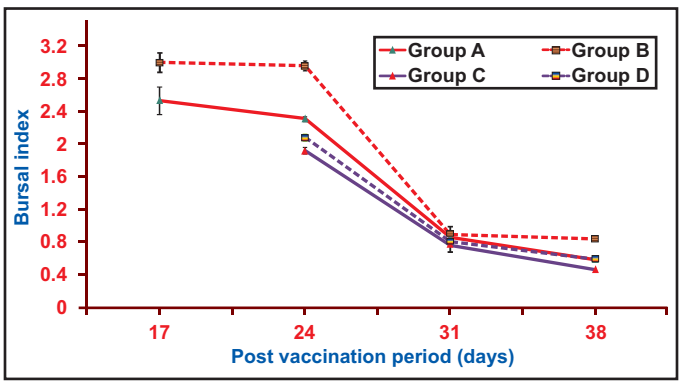

Fig. 2

CONCLUSION

It can be concluded that Spirulina was able to reduce the immunosuppression caused by IBD vaccine if given at the rate of 1% through feed from 10 to 20 days of age along with IBD vaccine.

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