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The Dynamics of Probiotics on Growth Performance and Immune Response in Broilers

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Abstract: The research work was conducted on "Hubbard Isa Starbro" broilers to evaluate the dynamics of probiotics relating to live weight gain, carcass yield, weight of cut up meat parts and immune response. Day old broiler chicks were divided into four groups as group A (Vaccinated probiotics fed group), B (Nonvaccinated probiotics fed group), C (Vaccinated conventional fed group) and D (Nonvaccinated conventional fed group). Groups C and D were taken as control birds fed with commercial ration and groups A and B as experimental birds were fed with commercial ration with the addition of 2gm probiotics (Protexin® Boost)/10 litres drinking water upto 6th week of age. The result evidenced the following information: (a) The live weight gains obtained were significantly ($p<0.01$) higher in experimental birds as compared to control ones at all levels during the period of 2nd, 4th, 5th and 6th weeks of age, both in vaccinated and nonvaccinated birds. (b) A significantly ($p<0.01$) higher carcass yield occurred in broiler chicks fed with the probiotics on the 2nd, 4th and 6th week of age both in vaccinated and nonvaccinated birds. The weight of leg was found significantly ($p<0.01$) greater for experimental birds as compared to control ones on the 2nd, 4th and 6th week of age. A significantly ($p<0.01$) higher breast weight in broiler chicks fed with the probiotics was observed on the 4th and 6th week of age. Analogously a significantly ($p<0.05$) higher breast portion weight was found in experimental birds as compared to control ones during 2nd week of age. (c) The antibody production was found significantly ($p<0.01$) higher in experimental birds as compared to control ones. Significant differences were also observed in the weight of spleen and bursa due to probiotics supplementation. The results of the study thus revealed that probiotics supplementation promoted significant influence on live weight gain, high carcass yield, prominent cut up meat parts and immune response.

Key words: Probiotics, broiler growth, immune response

Introduction

Poultry are now a days raised under intensive production systems in densely populated colonies or flocks to achieve high levels of economic efficiency. During this process chickens may get stress from a number of factors such as overcrowding, unfavourable ambient medium, feed-intake and vaccination etc. The dietary use of probiotic feeding is gaining momentum in broilers to counteract and minimize the stresses (Cavazzoni *et al*., 1998; Mahajan *et al*., 1999; Cortes *et al*., 2000; Gunes *et al*., 2001 and Shoeib and Madian, 2002). Simultaneously, the adverse effect of antibiotic feeding has encouraged a shift in favour of feeding probiotics to boost up productive performance of chickens (Fuller, 1989). Despite several reports on probiotics feeding, information with respect to their effects on immune response is meager. The present study was, therefore, undertaken to determine the effect of feeding probiotics on growth performance and immune response in broilers.

Materials and Methods

Experimental birds: Day old "Hubbard Isa Starbro" broiler chicks obtained from the local sale centre of Kazi Farms Limited, Mymensingh, Bangladesh were subjected to this experimental study. A total of eighty day old broiler chicks were divided into two main groups-group I (Probiotics fed group) and group II (conventional fed group) at the onset of the experimental study. All birds belonging to group I and II were further divided into four subgroups as group A (Vaccinated probiotics fed group), B (Nonvaccinated probiotics fed group), C (Vaccinated conventional fed group) and D (Nonvaccinated conventional fed group) on 6th day of age. The birds were reared under hygienic management practices throughout the entire period of study.

Feeding and management: Commercially available poultry feed (Quality Feeds Ltd., Dhaka) was used throughout the experimental study. The broiler chicks were fed with standard broiler starter, broiler grower and broiler finisher ration as formulated by Quality Feeds Ltd., Dhaka. As per instruction probiotics were added to drinking water at a level of 2g/10-litres water and was given to birds belonging to group A and B for 5 days in a week. The remaining two groups such as group C and group D were kept as control without adding probiotics in drinking water.

Table 1a: Effect of probiotics feeding on live weight, carcass yield and cut up meat parts of broilers

		Live weight (in gm)	Carcass yield (in gm)	Cut up meat parts (in gm)	
				Leg	Breast
Probiotics fed group (PFG)					
0 day		42.25±1.13[a]	-	-	-
1st week	A	141.25±3.15[a]	-	-	-
	B	140.00±2.04*[a]	-	-	-
2nd week	A	370.00±2.04[a]	247.25±3.04[a]	87.50±3.23[a]	67.50±3.23*[a]
	B	413.75±4.27[a]	262.50±3.23[a]	90.00±2.04[a]	78.75±2.39*[a]
3rd week	A	787.50±12.50[a]	-	-	-
	B	787.50±21.65[a]	-	-	-
4th week	A	1313.75±5.54[a]	887.50±3.23[a]	242.50±3.23[a]	267.50±3.23[a]
	B	1361.25±4.27[a]	922.50±3.23[a]	257.50±3.23[a]	277.50±3.23[a]
5th week	A	1757.50±3.23[a]	-	-	-
	B	1772.50±3.23[a]	-	-	-
6th week	A	2348.75±4.27[a]	1677.50±3.23[a]	457.50±3.23[a]	522.50±3.23[a]
	B	2372.50±3.23[a]	1717.50±3.23[a]	468.75±4.27[a]	541.25±4.27[a]

Table 1b: Effect of conventional feeding on live weight, carcass yield and cut up meat parts of broilers

		Live weight (in gm)	Carcass yield (in gm)	Cut up meat parts (in gm)	
				Leg	Breast
Conventional fed group (CFG)					
0 day		42.15±1.18[a]	-	-	-
1st week	C	133.75±4.73[a]	-	-	-
	D	130.00±3.54*[b]	-	-	-
2nd week	C	345.00±2.89[b]	198.75±2.39[b]	67.50±3.23[b]	55.00±2.04*[b]
	D	347.50±2.50[b]	212.50±3.23[b]	72.50±3.23[b]	68.75±3.15*[b]
3rd week	C	737.50±23.94[a]	-	-	-
	D	750.00±20.41[a]	-	-	-
4th week	C	1158.75±4.27[b]	787.50±3.23[b]	197.50±3.23[b]	205.00±2.04[b]
	D	1217.50±3.23[b]	826.25±5.54[b]	207.50±3.23[b]	218.75±2.39[b]
5th week	C	1568.75±4.27[b]	-	-	-
	D	1617.50±3.23[b]	-	-	-
6th week	C	1952.50±3.23[b]	1317.50±3.23[b]	402.50±3.23[b]	432.50±3.23[b]
	D	1997.50±3.23[b]	1342.50±3.23[b]	412.50±3.23[b]	452.50±3.23[b]

A and C: Vaccinated birds B and D: Nonvaccinated birds

Means with different superscripts columnwise differ significantly at **p<0.01 but means with different superscripts with * columnwise differ significantly at *p<0.05.

Protexin® Boost : Protexin® Boost marketed by Novartis (Bangladesh) Limited is a product containing nine strains of variable organisms namely *Lactobacillus plantarum*, *Lactobacillus bulgaricus*, *Lactobacillus acidophilus*, *Lactobacillus rhamnosus*, *Bifidobacterium bifidum*, *Streptococcus thermophilus*, *Enterococcus faecium*, *Aspergillus oryzae* and *Candida pintolopessi*.

Immunization: Birds were vaccinated against Baby chick Ranikhet disease by BCRDV and Gumboro disease by Bur-706 vaccine (Merial, France).

Body weight of birds: The live body weight of four birds from each subgroup was taken on day old age and sequentially at 7 days interval up to the end period of the experiment.

Carcass yield and cut up meat parts: To study the carcass yield and cut up meat parts of birds, four birds from each group were sacrificed randomly on the 2nd, 4th and 6th week of age and dressed. Weight of carcass and cut up meat parts such as leg and breast were calculated separately.

Experimental immunization: For experimental immunization, four birds of 30 days old from each group were injected intravenously (brachial vein) with 0.1 ml of 0.5% sheep red blood cells (SRBC). Blood samples were collected after 5 days of inoculation to measure the antibody production using a microtiter hemagglutination assay (Wegmann and Smithies, 1966).

Statistical analysis: The collected data on live weight,

Table 2: Mean (±SE) antibody titre (log_2) and mean (±SE) weight of spleen and bursa of broilers at the 5th week of age

Parameters	Probiotics fed group (PFG)		Conventional fed group (CFG)	
	A	B	C	D
Antibody titer (log_2) to SRBC antigen	6.5±0.29[a]	5.5±o.29[a]	3.25±0.25[b]	2.25±0.25[b]
Spleen (weight in gm)	0.43±0.01*[a]	0.70±0.02[a]	0.38±0.01*[b]	0.44±0.02[b]
Bursa (weight in gm)	1.38±0.12[a]	1.76±0.08*[a]	0.93±0.04[b]	1.46±0.05*[b]

A and C: Vaccinated birds B and D: Nonvaccinated birds

Means with different superscripts row wise differ significantly at **p<0.01 but means with different superscripts with * row wise differ significantly at *p<0.05.

carcass yield, cut up meat parts, antibody titre, spleen and bursa weights were analyzed using MSTAT computer package programme in a Completely Randomized Design (Steel and Torrie, 1980) and means were compared for significant differences using Duncan's multiple range test (Kramer, 1956).

Results and Discussion

Data on live weight gain, carcass yield and prominent cut up meat parts of broilers during experimental periods are presented in Table 1a and 1b. It is obvious from the result that the live weight gains were found significantly (p< 0.01) higher in experimental birds as compared to control ones at all levels during 2nd, 4th, 5th and 6th weeks of age, both in vaccinated and nonvaccinated birds. The analysis of data clearly evidenced that the average live weight gains were found always on the increase in non-vaccinated birds as compared to vaccinated birds on the 2nd, 4th, 5th and 6th week of age. This result is in agreement with many investigators (Manickam *et al.*, 1994; Chiang and Hsieh, 1995; Kahraman *et al.*, 1997; Cavazzoni *et al.*, 1998; Mahajan *et al.*, 1999; Singh *et al.*, 1999). Recently Cortes *et al.* (2000); Gunes *et al.* (2001); Hamid and Qureshi (2001) and Shoeib and Madian (2002) who demonstrated increased live weight gain in probiotic fed birds.

The occurrence of a significantly (p<0.01) higher carcass yield in broiler chicks fed with the probiotics on the 2nd, 4thand 6th week of age both in vaccinated and non-vaccinated birds. It is interesting to note that the average carcass weight was estimated to have yielded more in non-vaccinated birds than the vaccinated birds on the 2nd, 4th and 6th weeks of age. Although Mahajan *et al.* (1999) recorded in their study that mean values of giblets, hot dress weight, cold dress weight and dressing percentage were significantly (p<0.05) higher for probiotic (Lacto-Sacc) fed broilers.

The analysis of data as presented in Table 1a and 1b focuses that the weight of leg was found significantly (p<0.01) greater for experimental birds as compared to control ones on the 2nd, 4thand 6th week of age. While a significantly (p<0.01) higher breast weight in broiler chicks fed with the probiotics was observed on the 4th and 6th week of age. The present findings indicated that in Protexin® Boost fed broilers, the yield of cut up meat parts was better than the control ones, which might be due to the higher body weight and better conformation and finish. Similar findings were also demonstrated by Mahajan *et al.* (1999).

The development of antibody production in response to SRBC and gain in spleen and bursal weights of broilers are presented in Table 2. The antibody production was found significantly (p<0.01) higher in experimental birds as compared to control ones. Perdigon *et al.* (1995) demonstrated in their study increased antibody production in response to SRBC antigen by oral inoculation of Lactobacillus in mice. Panda *et al.* (2000) and Cross (2002) indicated that some probiotics could stimulate a protective immune response sufficiently to enhance resistance to microbial pathogens. The present results have indicated that antibody productions contributed more appreciably to increase in vaccinated birds as compared to non-vaccinated ones.

In non-vaccinated birds fed with the probiotics there is a slight increase in weights of spleen (p<0.01) as compared to control ones but a significantly (p<0.05) higher spleen weights was found in vaccinated birds fed with the probiotics. Analogously the weights of bursa were found significantly (p<0.01) higher for vaccinated birds fed with the probiotics as compared to control ones. However a significantly (p<0.05) higher bursal weights were obtained in non-vaccinated birds fed with the probiotics. The present results demonstrated that the differences in the weight of spleen and bursa of probiotics and conventional fed broilers could be attributed to different level of antibody production in response to SRBC. It is interesting to note that the weights of spleen and bursa were found higher in nonvaccinated broilers as compared to vaccinated broilers.

From the present results it was concluded that supplementation of probiotics had significant effect on growth performance and immune response in broilers.

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