ISSN 1819-1878

Asian Journal of Animal Sciences

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Asian Journal of Animal Sciences 5 (4): 277-284, 2011
ISSN 1819-1878 / DOI: 10.3923/ajas.2011.277.284
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Effect of Probiotic Supplementation on the Performance of Broilers

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ABSTRACT

Probiotic feeding leads to the development of stable type of micro flora which helps the bird to resist infections noticeably in the intestinal tract and helps in several ways. With this objective present study was under taken to evaluate the effect of probiotic on performance of commercial broiler chicks. In study two groups one without probiotic (P_0) and another with Probiotic (P) supplementation were considered for the study. The experiment consisted of two replicates for probiotic groups. The performance of broiler was evaluated in terms of growth, feed efficiency and percent mortality at 6th week of age. Data were analyzed on survivor and equal number of bird's per subclass basis. Analysis of variance revealed that the difference between replicates were not significant for the different traits under study as such all subsequent analysis was performed on combined sex basis. Inclusion of probiotic in diet also affected highly significantly both the sexes for this age of body weight. Broiler group fed with, diet P (with Probiotic) were significantly heavier than the group fed with, diet P_0 (without Probiotic). The inclusion of probiotics showed increased feed efficiency, better quality of broiler meat. The probiotic exerted highly significant effect on 2nd, 3rd and 5th weekly feed efficiency and also on overall feed efficiency. Overall performance of the broilers feded with the diet containing probiotics was found better in terms of feed efficiency, growth and meat quality. It might be due to suppressive effect of probiotic on unwanted organism and promotion of health status of the broilers.

Key words: Broilers, probiotic, body weight, feed efficiency, percent mortality

INTRODUCTION

Poultry occupies an important place in Indian economy contributing more than Rs. 11,000 crores to the national GDP. India ranks 4th and 18th with respect to production of egg and broiler respectively in the world (Yadav, 2003). Certain micro flora in the gut of birds is known to ameliorate the effects of such stress factors using probiotics especially during period of stress. These microbes can enhance the development of favorable micro flora in the gut of poultry. Intensive rearing conditions contribute to the delay in development of normal intestinal flora. Probiotic feeding leads to the development of stable type of micro flora which helps the bird to resist infections noticeably in the intestinal tract. This phenomenon is referred to by many terms by various authors as bacterial antagonism, bacterial interference, barrier effect, colonization resistance and competitive exclusion. Under such circumstances antibiotics are often used to suppress or eliminate harmful organism in the intestine to improve growth and feed efficiency (Fuller, 1989).

Probiotics have been introduced as an alternative to antibiotics. The use of antibiotics as routine feed additives has been banned in some countries because of public concern over possible antibiotic residual effects and the development of drug-resistant bacteria. The commercial use of probiotics in poultry industry is relatively new. Probiotic represents a single or mixed culture of live microorganisms which when applied to animals, affects the host beneficially by improving the properties of indigenous microflora (Hong *et al*., 2005). Probiotics come under the category of as Generally Recognized as Safe (GRAS) ingredients classified by Food and Drug Administration (FDA). They have no side and residual effects. Probiotics regulates the microbial environment in the gut, reduce digestive upsets and prevent pathogenic gut bacteria, thereby improve live weight gain, improve feed conversion ratio, reduce mortality, increase feed conversion ratio in layers and increase egg production. Probiotics commercially available contains strains of genera *lactobacillus* (mainly), *Bifidobacterium, Streptococcus, Bacillus, Bacteroides, Pediococcus, Leuconostoc, Propionibacterium, Saccharomyces cerevisiae* and *Aspergillus oryzae* (Chaucheyras *et al*., 1995). *In vitro* and *in vivo* studies have demonstrated that lactic acid producing bacteria are able to inhibit the growth of poultry pathogen like *Salmonella* and *E. coli* by lowering the pH of the gut (Kung, 2001; Lee *et al*., 2003; Frizzo *et al*., 2010).

The development of favorable microflora in the gut of poultry can be enhanced by using probiotic especially during period of stress (Krehbiel *et al*., 2003). Consumption of contaminated feed, bad weather, poor-management, transportation, poor housing conditions, changes in feed, presence of aflatoxins in feed, prolonged antibiotic therapy and disease stress). Proposed production benefits of probiotics include enhanced survival of chicks, reduction or prevention of gastrointestinal disorders, increased growth rate, improved feed efficiency, enhanced immune response and ammonia gas emission in broiler house etc. The application of probiotics like *Lactobacillus*, yeast etc. is receiving much attention. The addition of these substances to the feed or their introduction to animal body exploits the potential of utilization of feed and improves the efficiency of utilization of feed (Nocek *et al*., 2002; Rose, 1987). Keeping all these facts in mind present study was undertaken to know the effect of probiotic on the performance of broilers in terms of their growth, feed efficiency and meat quality etc.

MATERIALS AND METHODS

The experiment was conducted to study the effect of Probiotics (P) on the performance of day old sexed four hundred and eighty commercial broiler chicks. A group of twenty broilers (Male and female) distributed in 12 treatments replicated twice. The chicks were reared in electric battery brooders under same environmental conditions. These chicks were allotted at random to each treatment. The "Bioboost-YC" each gram provides, Live Yeast Culture (Strain SC-47) was used @ 200 g t^{-1} of feed. The composition of experimental ration having 0, 5 and 10% Dried Poultry Excreta is given in the Table 1.

Data pertaining to performance traits such as growth, feed efficiency, conformation traits and percent mortality, body weights were recorded by weighing individual chicks at weekly interval upto 6 weeks of age. Chicks were fed experimental ration *ad-libitum*. Difference in initial and final body weight represented the weight gain by chicks over the corresponding period. Weighed amounts of diet were provided to chicks. Feed consumed and weight gain was recorded weekly. The percent mortality was also regularly recorded for each group. The data collected under study were analyzed as 3×2×2 factorial completely randomized design according to Snedecor and Cochran (1995).

Table 1: Composition of experimental ration

Ingredients	D0 (0% DPE)	D1 (5% DPE)	D2 (10% DPE)
Maize	56	56	56
DORP	05	02	-
Soya-Cake	15	14	08
GNC	11	12	13
Jawala Fish	10	08	10
Min. Mix.	2.5	2.5	2.5
Vit. Mix.	0.5	0.5	0.5
DPE	-	5	10

The traits like Body weight (g), feed efficiency and mortality (%) were recorded on weekly basis for comparative evaluation and interaction effects of all treatments. The biweekly records of the feed offered and residual amounts of weigh backs were maintained for each replicate to calculate the feed consumption per bird. Similarly biweekly records of the water offered and residual amounts of weigh backs were maintained for each replicate to calculate the water consumption per bird. Within the same house, in a specific battery brooder system, water was placed in each pen to know the actual water intake of the experimental birds throughout the experiment. For body weight measurement birds were weighed individually at biweekly intervals and the body weights were recorded to calculate body weight gains. Feed Conversion Ratio (FCR) was calculated by the standard formula using total feed consumed (g) / bird divided by total body weight gain (g). To know the status of mortality daily observations were made to record the occurrence of deaths in different experimental treatments. The cost of broiler production was also estimated for rising 6th weeks broilers under different treatments include the cost of day old chick, feed, probiotic and cost of labor. Cost of other inputs was not included in this study.

Statistical analysis: Means were compared and considered significant at 5% significance level.

RESULTS AND DISCUSSION

Body weight of the broilers week wise showed that at first week of age the body weight of broilers with Probiotic (P) supplemented diet results numerically higher body weight than without probiotics (P_0) supplemented diet. The probiotic was also found to have non-significant effect for first week body weight of males and females. In second week inclusion of probiotic in diet did not show the significant effect on two weeks body weight in either of the sexes while in third week inclusion of probiotic in diet also affected highly significantly both the sexes for this age of body weight. It was also found that the group fed with diet P (with Probiotic) was significantly heavier than the group fed with diet P_0 (without Probiotic). In fourth week probiotic supplementation there was highly significant effect on body weight of both the sexes and this was also true for combined sex analysis. Similar findings were observed in fifth week and significantly higher body weight obtained in the chicks fed on probiotic supplemented diet than chicks fed on diet without probiotics. However, in sixth week inclusion of probiotic revealed significant effects on males body weight and highly significant on females body weight. Dhande *et al.* (1993) observed that probiotic ('Giprobiotic') fed broilers had higher body weight and better feed conversion efficiency at six weeks of age. Chicks of both sexes showed higher body weight with diet having probiotic (Table 2, 3). The improvement in weekly body weights due to supplementation of probiotic indicated that the inclusion of probiotic beneficially affects the host by improving its intestinal microbial balance as reported by Fuller (1989).

Table 2: Replicate wise weekly body weight means

DPE	Enz.	Prob.	Replicates	Day old	I week	II week	III week	IV week	V week	VI week
D0	E0	P0	R0	42.78	106.82	265.70	370.20	641.05	908.36	1068.22
			R1	44.86	105.47	260.94	363.24	627.01	896.86	1055.50
		P1	R0	42.78	104.74	262.16	386.22	674.42	990.01	1049.27
			R1	41.92	99.24	253.48	379.63	662.07	1028.51	1062.23
	E1	P0	R0	42.54	103.64	267.05	383.16	649.01	963.35	1241.78
			R1	40.82	100.96	262.91	374.61	639.71	956.51	1206.71
		P1	R0	43.02	105.84	273.16	394.16	669.16	988.77	1211.22
			R1	43.14	104.51	261.06	386.34	657.67	970.94	1104.16
D1	E0	P0	R0	43.02	105.11	267.05	377.05	669.16	943.56	1020.56
			R1	43.38	100.22	255.21	377.91	657.92	949.42	1037.66
		P1	R0	43.75	107.31	266.44	378.28	660.01	971.66	1069.44
			R1	44.24	105.72	265.34	368.98	666.48	973.62	1064.68
	E1	P0	R0	41.92	104.62	281.72	384.38	699.72	1017.51	1214.28
			R1	42.69	100.34	293.34	378.15	682.12	1006.51	1196.06
		P1	R0	43.26	107.06	279.88	389.88	730.27	1078.61	1306.56
			R1	43.76	102.66	268.41	379.98	715.97	1076.78	1317.81
D2	E0	P0	R0	41.81	106.33	252.38	359.33	702.77	956.38	1109.16
			R1	42.77	101.32	221.22	353.11	685.42	958.71	1097.68
		P1	R0	44.24	105.72	248.72	357.51	684.44	968.61	1126.88
			R1	43.26	102.91	25.66	346.62	688.23	951.62	1166.01
	E1	P0	R0	41.92	107.92	257.03	377.66	711.94	1035.83	1202.06
			R1	42.53	101.93	255.81	385.48	703.63	1048.06	1169.54
		P1	R0	43.75	109.02	267.66	400.27	709.51	1067.01	1220.38
			R1	43.52	108.04	265.83	390.98	718.54	1062.96	1202.42

Table 3: Means for weekly body weights of combined sex due to the Probiotics effects

Factors	Day old	I week	II week	III week	IV week	V week	VI week
Prob. P0	42.60	103.41	234.99	345.68	633.49^{a}	916.03^{a}	1016.68^{a}
PI	43.04	103.66	238.85	355.18	669.77^{b}	989.64^{b}	1175.01^{b}
SE Range	0.31-0.37	0.28-0.29	1.94-2.18	2.02-2.15	2.50-3.15	2.97-3.20	3.82-4.18

Means having similar super-scripts do not doffer significantly at 5% significance level

Table 4: Means for over all feed efficiency on pooled sex basis due to the Probiotics effects

Factors	I week	II week	III week	IV week	V week	VI week	Overall FE
Prob. P0	1.63	1.68^{b}	1.78^{b}	1.97	2.16^{b}	2.26	2.12^{b}
PI	1.62	1.66^{a}	1.77^{a}	1.97	2.15^{a}	2.26	1.84^{a}
SE Range	0.003-0.004	0.003-0.004	0.003-0.004	0.003-0.004	0.002-0.003	0.01-0.02	0.04-0.05

Means having similar super-scripts do not differ significantly at 5% significance level

Similar findings were observed with effect of probiotics on growth performance. For commercial broiler chicks the data on feed efficiency due to main and interaction effects on weekly and overall feed efficiency are presented in Table 4. The probiotic exerted highly significant effect on 2nd, 3rd and 5th weekly feed efficiency and also on overall feed efficiency. At 6th week of age feed efficiency observed for P_0 and P were 2.26 and 2.26. Similar results that supplementation of probiotic in feed promote the growth and feed efficiency for better production of meat and egg were reported by Verma (1992). Present results are also similar with the above reports and with the findings of Jayakumar *et al.* (1996). Kalbande *et al.* (1992) and Mishra *et al.* (1994) also reported the increase

in weight and better quality of broiler meat with the use of probiotics in poultry rations. The report on effect of probiotics on body weight of broilers is conflicting. While several workers have claimed a significant improvement in body weight of broilers following probiotic supplementation in broiler diet (Kumararaj *et al*., 1997; Gohain and Sapcota, 1998), there are others who have concluded based on their studies that addition of probiotics did not significantly affect the body weight of broilers (Samanta and Biswas, 1995). The beneficial effect of probiotic supplementation to broiler diet in terms of increased body weight and body weight gain is well documented in study of Singh *et al*. (1999) and Banday and Risam (2001).

Similar findings were observed with effect of probiotics on growth performance which is well documented by the reports of Brzoska *et al*. (1999), Jin *et al*. (2000), Yu *et al*. (2008), Murry *et al*. (2004), Sieo *et al*. (2005) and Apata (2008).

The inclusion of probiotics showed increased feed efficiency, better quality of broiler meat and extensive decrease in infectious diseases were also reported by Jayakumar *et al*. (1996). The present findings are in agreement with the findings of Wiseman (1990) and Mudalgi *et al*. (1993). This observation was in line with Dhande *et al*. (1993), Prasad and Sen (1993), Baidya *et al*. (1994), Samanta and Biswas (1995), Jin *et al*. (1996), Singh and Sharma (1996), Katoch *et al*. (1998), Silva *et al*. (2000), Zulkifli *et al*. (2000), Senani *et al*. (2000), Kim *et al*. (2001), Gupta *et al*. (2003), Manna *et al*. (2003) and Sharma *et al*. (2003). They observed that broilers diet supplemented with probiotic showed improved feed intake than the control. This can be substantiated from the fact that the experimental birds had consumed significantly more feed than control ones due to increased digestive efficiency (Katoch *et al*., 1998; Banday and Risam, 2001). Sieo *et al*. (2005), Karaoglu and Durdag (2005), Onderci *et al*. (2006), Gunal *et al*. (2006), Ahmad (2006), Dea *et al*. (2006) and Onderci *et al*. (2008) revealed that the broilers fed with probiotics significantly improved feed to gain ratio of the broilers. Present findings also indicated significantly better weekly feed conversion efficiency on probiotic supplementation in the diet of commercial broiler chicks.

CONCLUSION

The present study revealed that supplementation of probiotics in the feed of poultry chicks enhances their body weight and improved growth rate up to sixth week of age. The *Saccharomyces cerevisiae* was used as a probiotic in the diet and added at the normal recommended rate in the various combinations of the diet and it was found that the diet supplemented with probiotic preparation had superior overall feed utilization efficiency than the control. Besides these effects there were evidences of lower microbial load in intestines feed with probiotic supplemented feed.

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