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Comparative assessment of different dose of probiotics on growth performance and economics of broiler chicken

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Abstract
An experiment was conducted to study the effect of probiotics supplementation on growth performance and economics of feeding in broilers. A total of 1000, day old broiler chickens were randomly assigned into four groups as T_0, T_1, T_2 and T_3 group. Group T_0 was considered as control fed with commercial ration while T_1, T_2 and T_3 group fed with commercial ration with the addition of 1gm, 2gm and 3gm probiotics/10 liters drinking water respectively upto 35 days of age. On day 35 (28th day of experiment) was observed that the body weight in the control group T_0 was 1279.31±39.14, in the treatment group $T_1$was 1346.52±39.58, in the treatment group $T_2$was 1602.48±45.08 and in the treatment group T_3was1386.12±39.91. All the data was statistically significant at 1% ($P<0.05$) level. The highest body weight was recorded in the treatment group T_2 and lowest in the control group T_0.Weekly body weight gain in 2nd, 3rd, 4th and5th weeks of experiment shows the weight increased significantly at 1% ($P<0.01$) level of significance. Birds in the treatment group T_2 consumed significantly more feed than control group as well as the other groups $T_1$and T_3. Whereas, the birds feed probiotics level 3gm/L in group T_3 consumed significantly less feed than the other probiotics treatment groups and the control group. At 3rd, 4th and 5thweeks of age there were significant differences in the daily feed consumption among the probiotics treatment groups and also between the probiotics groups and the control group. The daily profit was estimated as Rs. 16.25, 20.61, 41.04 and 28.74 per bird in T_0, T_1, T_2 and T_3 group bird where as the cost-benefit ratio was 1:1.15, 1:1.18, 1:1.35 and 1:1.26 respectively. It signifies that the body weight gain of broiler chickens was improved which provided more earning to the farmer.

Keywords: Broiler, Economics, FCR, Growth and Probiotics

Introduction

The poultry industry helps to fill the gap between requirement and availability of huge quality protein for human consumption, side by side it is the source of income and can create employment opportunities for the people in the shortest possible time. But this industry often faces major economic losses to infectious disease. This led to increased use of antibiotics in the poultry industry for therapeutic, prophylactic and growth promotion purposes. There is a widespread discouragement on the use of antibiotics in poultry industry as antimicrobial compounds to control infection and as growth promoters because of bacterial resistance and occurrence of residues of antibiotics in poultry meat and eggs which have deleterious effects on human consumers. This is necessitating the use of probiotics as alternative substance to antibiotics.

Probiotics are feed additives that contains live microorganism and promote beneficial effect to the host by favouring the balance of the intestinal microbes (Fuller, 1989) [4]. The probiotics feeding assists in preventing colonization of producing certain enzyme like substance (Lee *et al.*, 2007). Probiotics are claimed to exert beneficial effect on live weight gain, feed consumption, feed conversion ratio and livability (Mohan *et al.*, 1996) [12]. It was reported that probiotics have a good impact on the poultry performance (Mountzouris *et al.*, 2007; Koenen *et al.*, 2004) [9], improve microbial balance, synthesis vitamins (Fuller, 1989) [4], decrease pH and release bacteriocins (Rolfe, 2000) [18], improve feed consumption in layers and broilers (Naha shan *et al.*, 1994) [14]. The present investigation was therefore, undertaken to study the

effect of supplementation of different dose rate of probiotics on the growth performance in broiler chicken.

Material and Methods

Experimental birds

Day old chicks (strain Cobb-500) marketed by Venky's Poultry and Hatchery Ltd. were purchased from local market for this experiment. The chickens were allowed to take rest for 6 days for the adaptation. The chicken was supplied with normal diet and water.

Experimental diets

The commercial broiler ration and probiotics were purchased from the local market. Broiler chicks of group – T_0: fed with commercial broiler ration and fresh drinking water. Broiler chicks of group – T_1: probiotics @ 1gm/10L, commercial broiler ration and fresh drinking water plus drinking water for 21 days. Broiler chicks of group – T_2: probiotics @ 2gm/10L drinking water commercial broiler ration and fresh drinking water plus for 21 days. Broiler chicks of group–T_3: probiotics @ 3gm/ 10Ldrinking water plus commercial broiler ration and fresh drinking water for 21 days.

Experimental design

A total of 1000, seven days old broiler chicks were randomly divided into 4 equal groups (n=250) and marked them as group T_0, T_1, $T_2$and T_3 for assessing the effect of probiotics. Broiler chicks of group – T_0: was kept as control and was not treated. Broiler chicks of group – T_1: was treated with probiotics @ 1gm/10L drinking water for 28 days. Broiler chicks of group – T_2: was treated with probiotics @ 2gm/10L drinking water for 28 days. A broiler chick of group – T3 was treated with probiotics @ 3gm/10L drinking water for 28 days. Initial body weight of each group was recorded just prior to separation. Body weight was recorded at seven days interval up to the end of 35 days of experimental period.

Housing and Management

An open sided house made of wire, net, wood and bamboo was used to rear the birds. Each bird was kept in 1 sq. ft. Proper litter management and hygienic condition was maintained. The bird was brooded to 28 days with proper lighting, temperature and humidity feeder and water management.

Biosecurity and Sanitation

The birds were vaccinated against New castle disease at 4th and 21th days and Infectious Bursal Disease at 11th and 18th days of age. Proper hygienic and sanitation programs were followed during the experimental period. To prevent the outbreak of disease strict bio-security was maintained during the experimental period.

Measurement of parameters

Body weight of broiler chicks was measured with the help of balance on the 7th day of age (35thdays of experiment) and sequentially at 7 days interval up to the end of the experiment.

Statistical Analysis

All recorded data were calculated and analyzed using statistical SPSS program for one way analysis of variance (ANOVA) followed by student T Test was done to know the differences among the treatment means at 5% level of significance.

Results and Discussion

With regard to the influence of probiotics on the body weight gain among groups at all times of this trial as illustrated in table-2.Results clearly demonstrated that the probiotics tested in the study significantly improved the body weight of the broiler chickens. The effect of probiotics started at two weeks of age. At 3 weeks of age, the probiotic supplementation showed significant increase in the body weight compared with the control group, at the same age, there were significant difference among the three probiotic treatment groups, with group of level 2gm/10L having the significantly higher body weights than the other levels of treatment as well as the control group. The positive effect of differences in the body weight persisted until 5 weeks of age. The differences in the body weight become greater towards the end of the trial period. On day 35 (28th day of experiment) was observed that the body weight in the control group T_0 was 1279.31±39.14, in the treatment group $T_1$was 1346.52±39.58, in the treatment group $T_2$was 1602.48±45.08 and in the treatment group T_3was1386.12±39.91. All the data was statistically significant at 1% ($P<0.05$) level. The highest body weight was recorded in the treatment group T_2 and lowest in the control group T_0.Although body weight on 1st day of experiment was more or less similar, a distinct fluctuation was observed with the advanced age (2nd, 3rd, 4th and 5th weeks of experiment) among different groups and always highest in group T_2.Weekly body weight gain in 2nd, 3rd, 4th and 5th weeks of experiment shows the weight increased significantly at 1% ($P<0.01$) level of significance. The body weight increased slowly in the control group T0 in the respective days of experiment but rise in the body weight was noticed in the treatment groups.

The results found in the study are in agreement with several reports demonstrating that probiotics supplemented to the birds improve the body weight gain. Pradhan *et al.* (1998) [17], Cavazzoni *et al.* (1998) [3], Singh *et al.*, (1999) [19], Ahmed *et al.* (2004), Islam *et al.* (2004) [7], Kabir *et al.* (2005) [8], Panda *et al.* (2006) [16], Temmerman *et al.* (2006), Liu *et al.* (2007) [11], Mountzouris *et al.* (2007), Torres-Rodrigeuz *et al.* (2007), Alkhalf *et al.* (2010) [2], Hasan *et al.* (2015) [5] and Hossain *et al.* (2016) [6]. But the present finding differs from the findings of Mohan *et al.* (1996) [12] who reported that the beneficial effect of probiotics was significantly increased during the first 3 weeks but not during the 4-6th weeks of growth. Panda *et al.* (1999) [15] reported that the body weight gain at 6th week of age were similar in all groups of dietary treatment. Yeo and Kim (1997) [23] found that average daily weight gain of chickens fed probiotics was significantly increased during the first 3 weeks but not during the 4-6th weeks of growth. Daily feed consumption of chicken fed on commercial ration supplemented with probiotics is shown in Table-3. Birds in the treatment group T_2 consumed significantly more feed than control group as well as the other groups $T_1$and T_3. Whereas, the birds feed probiotics level 3gm/L in group T3 consumed significantly less feed than the other probiotics treatment groups and the control group. At 3rd, 4th and 5thweeks of age there were significant differences in the daily feed consumption among the probiotics treatment groups and also between the probiotics groups and the control group. These finding s are in agreement with those of Willes *et al.* (2007) and Alkhalf *et al.* (2010) [2] who observed significant differences in the feed consumption and efficiency of broiler chickens receiving the probiotics.

Economics of probiotics supplementation

Economics of supplementing probiotics along with commercial broiler ration is given in Table-4. During 5 weeks of trial period, broiler chicken was fed with commercial broiler ration. Therefore calculation of feeding cost includes commercial broiler ration and probiotics. The cost of meat production was estimated to be Rs. 111.75, 114.39, 118.91 and 110.06 per bird per day in T_0, T_1, T_2 and T_3 group bird respectively. The daily earning was calculated as Rs. 128, 135, 160 and 139 per bird in T_0, T_1, T_2 and T_3 group bird respectively. Hence the daily profit was estimated as Rs. 16.25, 20.61, 41.04 and 28.74 per bird in T_0, T_1, T_2 and T_3 group bird respectively. The cost-benefit ratio was 1:1.15, 1:1.18, 1:1.35 and 1:1.26 in T_0, T_1, T_2 and T_3 group respectively. It signifies that the body weight gain of broiler chickens was improved which provided more earning to the farmer.

Table 1: Composition of Probiotics used in the diet of broiler chicken

S. No.	Composition (Each 125gm of probiotic contains)	Quantity
1	*Saccharomyces cerevisiae*	1000 billion CFU
2	*Lactobacillus acidophilus*	30000billion CFU
3	*Lactobacillus sporogenes*	30000billion CFU
4	*Bacillus subtilis*	60000billion CFU
5	*Bacillus licheniformis*	60000billion CFU
6	Fructo Oligo Saccharid (FOS)	5000 mg
7	Mannan Oligo Saccharid (MOS)	5000 mg

Table 2: Performance of different dose of probiotics on body weight means (gm) of broiler chicken

Age in week	T_0: No use of Probiotics	T_1:Probiotics 1gm/10 lit of water	T_2:Probiotics 2gm/10 lit of water	T_3:Probiotics 3gm/10 lit of water
1	129.02±10.37^a	137.92±11.42^a	150.46±12.88^a	134.84±11.05^a
2	301.29±20.09^b	307.24±19.75^b	390.14±27.95^a	312.07±20.67^b
3	580.80±32.60^c	611.04±36.44^b	751.41±42.14^a	617.34±35.61^b
4	943.47±42.30^c	1006.61±46.14^b	1215.51±54.13^a	1043.43±49.70^b
5	1279.31±39.14^c	1346.52±39.58^b	1602.48±45.08^a	1386.12±39.91^b

Means within rows with no common letters are significantly different (P<0.01)

Table 3: Daily feed consumption of broiler chicken supplemented with probiotics

Age in week	T_0: No use of Probiotics	T_1:Probiotics 1gm/10 lit of water	T_2:Probiotics 2gm/10 lit of water	T_3:Probiotics 3gm/10 lit of water
1	180.46±0.77^a	179.48±0.77^a	167.30±0.77^a	165.27±0.77^a
2	302.19±1.11^a	288.33±1.11^a	317.87±1.11^a	312.27±1.11^a
3	501.20±1.53^a	513.66±1.53^a	543.13±1.53^a	418.60±1.5^b
4	584.92±0.54^c	612.85±0.54^b	673.54±0.54^a	601.89±0.54^b
5	723.52±2.17^b	753.69±2.17^a	766.50±2.17^a	667.52±2.17^c

Means within rows with no common letters are significantly different (P<0.01)

Table 4: Economics of feeding different dose of probiotics on broiler chicken

S.No.	Parameters	T_0	T_1	T_2	T_3
1	Cost of chicks(per bird)	40	40	40	40
2	Total feed intake per bird(kg)	2.29	2.35	2.47	2.17
3	Cost of feed (Rs/bird/day)	71.75	73.63	77.39	67.99
4	Cost of probiotics(Rs/bird/day)	0.00	0.76	1.52	2.27
5	Total expanse(Rs/bird/day)	111.75	114.39	118.91	110.06
6	Initial by wt. per bird (gm)	40.10	40.00	40.02	40.12
7	Final by wt. per bird(gm)	1279.31	1346.52	1602.48	1386.12
8	Net by wt. per bird (gm)	1239.21	1306.52	1562.46	1346.00
9	Gross return (Rs/bird)	128	135	160	139
10	Net return (Rs/bird)	16.25	20.61	41.04	28.74
11	B:C ratio	1.15	1.18	1.35	1.26

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