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Research Article

Effect of Feed Grade Probiotic on the Growth Parameters of Broiler: Comparative and Randomized Clinical Trial

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Abstract

The main objective of the present study was to study the effect of locally available Probiotic Organic Green Culture ZS, added in the broiler ration. The effectiveness of the probiotic was measured in terms of gain in body weight, dry matter intake (DMI), feed efficiency and Hemagglutination Inhibition (HI) antibody titre against Newcastle Disease (ND) as an indicator for the immunity status. Two hundred and twenty four day old chicks were used. These chicks were randomly distributed into 2 main groups; A and B where each main group was further divided into 4 sub groups contained 28 birds each. Two experimental diets viz, I and II were randomly allotted to these groups. Both diets were containing 1 kg feed (basal feed ingredients) added probiotic at 0 and 2 g/kg levels. Each ration was offered *ad libitum*. The experiment lasted for 21 days. The data were statistically analyzed using Completely Randomized Design. Probiotic treatment highly ($P < 0.001$) effected the gain in body weight, DMI, feed efficiency at starter phases and HI antibody titre against ND of the experimental birds. The mean gain in weight was 515g and 573g for groups A and B respectively. Mean DMI was 645g and 600g respectively. Mean feed efficiency was 1.25 and 1.04 respectively for groups A and B respectively. A non significant ($P > 0.001$) difference was observed among both groups for HI antibody titre against Newcastle Disease at day 0 and the mean antibody titre values were 2.37 and 2.25 for groups A and B respectively while, at day 10th and 20th probiotic treatment resulted obvious difference ($P < 0.001$) between the two groups. Mean values were 3.18 and 3.93 and 5.25 and 8.00 at day 10th and 20th respectively. It was concluded that Probiotic addition of 2 g/kg rations successfully improved the overall performance of the experimental birds at starter phase. Further research work is needed to use the same levels of probiotic in the rations of parent stock and layers under local farm conditions.

Keywords: *Probiotic; Broiler; Feed Efficiency; HI and Randomized Clinical Trial*

Introduction

Poultry farming is a sub-sector of livestock which has been developed from backyard chicks, raising to commercial farming during the past four decades. Among all other agricultural industries, it is now considered as one of the most progressive and innovative business. The current investment in Poultry Industry is more than Rs. 700 billion. This industry is progressing at an impressive growth rate of 8 to 10 percent per annum over last few years. Pakistan has become the 11th largest poultry producer in the world [1].

In Pakistan, for meat and egg production on commercial scale, poultry raising was initiated in 1963. Further progress was made, when a Canadian firm, "Shaver" extended its collaboration with Pakistan International Air-lines, to establish a modern hatchery at Karachi in 1965. Since then, a rapid and a continuing boosting-up expansion has happened in this field. This in turn, brought a great revolution through increasing broiler and layer farming, hatcheries establishing and feed milling in the private sector, especially.

In Pakistan, poultry produces 1518 (000) tones of meat and 19052 million eggs annually. Poultry meat contributes 34% of the total meat production in the country [1].

Feed is the major component, affecting net return from the poultry business, because 60 to 75% of the total cost of production is spent on feed purchase [2,3]. To obtain more net return and minimize high expenses on feed, are the main challenges, for the present progressive poultry farmers. For this purpose, during the last decade, many research strategies have been practiced, such as introducing feed supplements and feed additives etc [4,5].

Probiotics are one of the feed additives; they are the live cultures of useful micro-organisms. Probiotic-X (Organic Green Culture ZS) newly introduced in Pakistan by a Korean company (Hanpoong industry) It contains micro-organisms like *Saccharomyces cerevisiae, Lactobacillus acidophilus, Bacillus subtilis and Aspergillus oryzae*. These micro-organisms check the growth of pathogenic bacteria in the gastrointestinal tract and enhance the growth of commensal bacteria. As a result both production and reproduction potentials of the bird are increased. Probiotics have also been reported to have the immune stimulating effect due to a reduced burden of pathogens on the immune system. It is therefore the product of interest, which was evaluated for its benefits in our local poultry production.

Materials and Methods

This study was conducted at MS Poultry Farm Baffa, District Mansehra.

Experimental design and birds

The comparative and randomized clinical trial was conducted by feeding 2 rations to 2 groups, with 112 birds per group. Each group was replicated in four with 28 birds per replicate (Table 1-3). For this purpose, three hundred day old broiler chicks were purchased from the local hatchery. Two hundred and twenty-four birds were selected on the basis of nearly the same body weight with a mean of 41.5 +/- 1.5g (range: 40 - 42g) and soundness of the general health, were randomly distributed into two groups. The groups were designated as A and B and two experimental rations were I and II respectively. Birds with extreme body weight, dull, depressed and any visible deformity were excluded. A representative sample of feed (Table 4) from each experimental ration was stored at -10°C for subsequent laboratory analysis (dry matter, ash, crude protein, crude fat and crude fiber) according to the procedure given in AOAC [6].

Treatments (Rations x Groups)		Replicates			
Rations	**Groups**	**1**	**2**	**3**	**4**
I	A	28	28	28	28
II	B	28	28	28	28

Table 1: *Experimental design- I for measurement of performance parameters.*

Treatments		Replicates			
Rations	**Groups**	**R1**	**R2**	**R3**	**R4**
I	A	4	4	4	4
II	B	4	4	4	4

Table 2: *Experimental design- II for measurement of antibody titer against ND.*

ME (Kcal/kg)	**2846.56**	**2846.56**
Crude protein	23.52	23.52
Crude fiber	4.27	4.27
Dry matter	87.74	87.74

Table 3: *Calculated proximate analysis.*

Ingredients	Ration I (control)	Ration II
Probiotic	0	2
Maize	320	320
Wheat	200	200
Canola meal	50	50
Corn gluten meal (60%)	50	50
Soybean meal	100	100
Blood meal	28	28
Fish meal	100	100
Rice polishing	80	80
Molasses	30	30
Rock phosphate	30	30
L-Lysine	0.8	0.8
DL-Methionine	1.3	1.3
Vit. Min. Premix	10	10
Total	1000	1000

Table 4: *Composition of the starter rations, using each ingredient g/kg.*

The data was statistically analyzed for growth performance parameters like gain in body weight, feed consumption, feed efficiency and antibody titer against ND with the standard procedures of analysis of variance using Completely Randomized Design, as described by Steel and Torrie [7]. The means were compared for significance of difference with the LSD procedure [7]. The statistical package (SAS, 2000) was used to perform the above analysis on computer.

Results and Discussion

Body weight gain

The mean gain in live weight was 515.75 and 573.75g for treatments I, and II respectively. Highly significant ($P < 0.001$) difference was observed between these two treatments for gain in body weight. Treatment II containing probiotic at 2 g/kg starter ration showed higher gain in body weight than treatments I had probiotic at 0 g/kg of starter ration (Table 5). It was hypothesized that the addition of probiotic would consistently increase the gain in body weight of the experimental birds. The hypothesis was found to be true, because, the gain in body weight of the experimental birds was increased with addition of probiotic in the experimental diets. The results of this study are in agreement with those reported by Chiang and Hsieh [8] who obtained growth response in broilers, even using a probiotic at a very low level such as 0.25 or 0.50 g/kg starter ration. Omprakash., *et al.* [9], Bilal., *et al.* [10] also found the highest gain in body weight by incorporating probiotic at 15 or 20 ml/litre drinking water in broilers, at starter phase.

Rations/Groups LSD values	Group A	Group B
Mean weight gain/chick (g) 6.66	515.75	573.75
Mean dry matter intake/chick(g) 8.21	645.75	600.00
Mean feed efficiency ratio	1.25	1.04
Mean antibody titre 0.031	5.25	8.00

Table 5: *Means with the similar superscripts are not significantly different.*

Feed consumption

Mean feed consumption for groups A and B was 645 and 599 g/chick, respectively given in table 4. Highly significant ($P < 0.001$) difference was observed in these two groups for feed consumption. The chicks in group B consuming feed added with probiotic at 2 g/kg showed the lowest intake as compared with those in groups A fed on probiotic at 0 g/kg starter ration. It was hypothesized that using probiotic in the experimental diets would not only enhance the digestion rate, but also increase the nutrient retention and decrease their passage rate. This finding is favored by Kumprecht and Zobc [11], Cortes., *et al*. [12] who reported that average feed intake was lowest in all the chickens getting probiotic while intake was highest in controlled groups. However, the results are contrary with those reported by Samanta and Biswas [13] they found no significant difference in feed intake between probiotic treated versus control groups.

Feed efficiency {Feed consumed (in gram)/Gain in body weight (in gram)}

Highly significant ($P < 0.001$) difference was obtained among all the experimental diets for feed efficiency. The chicks fed on control ration showed poor feed efficiency as compared to that fed on ration having probiotic. These findings are further supported by the work of many researchers such as Jin., *et al.* [14] and Ergun., *et al*. [15] reported best feed efficiency for the chickens raised on rations containing high levels of probiotic. The improved feed efficiency might be due to maintaining normal intestinal microflora by competitive exclusion and antagonism, altering metabolism, by increasing digestive enzyme activity and by improving digestion.

Effect of probiotic on hemagglutination inhibition (HI) antibody titre against newcastle disease (ND) in broiler chicks

The main objective of the study was to evaluate the effect of feeding probiotic added in the broiler rations, on their immune status. For such purpose, the data for HI antibody titre against ND was collected on different age days 0, 10 and 20.

On day zero, all the experimental birds were found similar for HI antibody titre against ND. Whereas, with feeding probiotic, obvious difference ($P < 0.001$) between the two groups for the HI antibody titre against ND was observed on days ten and twenty. The mean comparison showed that group B exhibited the highest number of HI antibody titre against ND as compared to group A.

It was hypothesized earlier that addition of probiotic in the experimental diet would improve the immune status of the experimental birds, consistently. Such improvement would enhance the overall growth performance of the experimental birds at starter as well as at finisher phase.

The overview of the results confirmed the proposed hypothesis. These investigations are further authenticated by the work of many researchers such as Jin., *et al.* [14], Shoeib., *et al.* [16] and Panda., *et al*. [17] reported improved immunity in the commercial broiler chickens by continuous feeding of the probiotic. Because, probiotic with adequate levels would improve the immunity of the experimental birds by neutralizing enterotoxins and antagonism and would prevent the colonization of the pathogenic bacteria. This in turn, would improve the general health.

Probiotics might be considered more effective, during the early life period of the chicks, where the micro flora is progressing or under pathogenic stresses. Such concept was favored by Schat and Myres [18]. The results obtained by the present study proved the hypothesis to be true on the basis of these concepts.

Conclusion and Recommendations

It was concluded that probiotic not only enhanced gain in body weight but also improved Feed efficiency by decreasing feed intake and increasing nutrient retention. Moreover, the health of the birds with probiotic was improved through maintaining normal intestinal microflora by competitive exclusion and antagonism.

Furthermore, the immunity of the birds was also improved against highly prevalent diseases especially Newcastle disease as was apparent from protective titers observed through HI in the birds with 2 gm of probiotic per kg of feed as compared to control group with no probiotics.

It is recommended that research trials should also be conducted to know the fate of probiotics in parent stocks (breeders) and layer birds.

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