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COMPARATIVE STUDY OF THE EFFECTS OF ERYTHRO F – Z, FURAZOLE AND GALLAMYCIN AS FEED ADDITIVES ON THE DIGESTIVE ACTIVITY OF BROILER CHICKS

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The effect of some feed additives on the digestive activity in broiler chicks was determined. Eightly-four day-old Hubbard broiler chicks were used. These chicks were randomly divided into twelve groups of 7 chicks each. Three such groups were randomly allotted to each ration i. e. A, B, C and D. The rations A, B and C had the addition of Erythro F–Z, Gallamycin and Furazole at the rate of 84, 25 and 80 g per 50 kg, respectively and the control ration D was without any feed additive. The result revealed that the feed additives significantly ($P < 0.01$) improved dry matter and protein digestibility, reduced intestinal thickness and decreased the flow rate of ingesta. Caecal Salmonella and *E.coli* load was also reduced by the feed additives.

INTRODUCTION

Poor digestibility of feed is often experienced in avians especially in poultry birds. The enteritis which is the major cause of inflammation or thickness of intestinal wall is caused by varying degree of bacterial load especially the Salmonella and *E. coli*. The performance of chicks is lowered due to low absorption because of increased thickness of intestinal wall, speedy movement of ingesta and passage of soft faeces. Antibiotics are generally used to check the bacterial load. These may interrupt a necessary metabolic pathway of mono–cellular organisms by inhibiting their mechanism of protein synthesis (Anonymous,1977).

A large number of antibiotics is available in the market with a lot of advertisement regarding their action on the reduction of intestinal bacterial load and enhancing of growth rate in broiler chicks. A study was thus conducted to observe the effect of three antibiotics namely, Erythro F–Z, Gallamycin and Furazole as feed additives on the digestibility of feed nutrients, flow rate of ingesta and bacterial load in broiler chicks.

MATERIALS AND METHODS

The experiment was conducted at the Poultry Experiment Station, University of Agriculture, Faislabad. Eighty - four day - old Hubbard broiler chicks were purchased from the market. They were randomly divided into 12 experimental units of 7 chicks each. Of these 12 experimental units , three units (replicates) were randomly allotted to each of the four different starter rations i.e. A, B, C and D upto 6 weeks of age. The rations A, B and C contained Erythro F – Z (84 g /50 kg) , Gallamycin (25 g /50 kg) and Furazole (80 g/50 kg) respectively, while the control ration D was without any feed additive.The finisher ration without any feed additive was offered during 7th and 8th weeks of age to all the experimental units.

All the experimental units were kept under similar environmental conditions. The birds were fed ad libitum. The chicks were vaccinated against Newcastle disease and were protected against coccidiosis through the administration of Amprosol.

The following parameters concerning digestive activity were recorded at 3rd, 6th and 8th weeks of age during the study.

i) Bacterial load of feed at the start of the experiment
ii) Dry matter and protein digestibility
iii) Flow rate of ingesta
iv) Intestinal thickness

Table 1. Average values of dry matter and protein digestibility, intestinal thickness, flow rate of ingesta and bacterial load of feed and caecal contents of broilers fed different feed additives

Description	Rations			
	A (Erythro F-Z)	B (Gallamycin)	C (Furazole)	D (Control)
1) Digestibuty (%)				
a) Dry matter	91.26^{b}	92.66^{a}	89.78^{c}	88.90^{d}
b) Protein	92.39^{b}	93.91^{a}	91.07^{c}	89.61^{d}
2) Intestinal thickness (mm)	2.66^{b}	2.46^{c}	2.90^{a}	3.00^{a}
3) Flow rate of ingesta (minutes)	207.83^{b}	213.33^{a}	200.66^{c}	186.00^{d}
4) Bacterial load				
a) Initial total bacterial load/feed	127716×10^{5}	136524×10^{5}	92484×10^{5}	132120×10^{5}
b) Salmonella count/g caeccal contents	6×10^{5}	5×10^{5}	8×10^{5}	9×10^{5}
c) *E. coli* counts /g caecal contents	12×10^{5}	8×10^{5}	15×10^{5}	17×10^{5}

Means with the same superscripts in a row show non-significant difference.

v) Caecal load of *E. coli* and Salmonella

All the starter rations were tested for bacterial load before the start of the experiment according to Salle (1961). At the end of 3rd, 6th and 8th week, one bird from each unit was picked randomly for the determination of flow rate of ingesta which was determined by indicator method, using ferric oxide (Maynard and Loosli,1969). During this period, the birds were kept in cages for the collection of droppings individually for 24 hours for determining dry matter and protein digestibility. All the rations and poultry droppings were dried in an oven at 105 °C and analysed for crude protein using Kjeldhal method (A. O. A. C.,1980).

Caecal load of *E. coli* and Salmonella were determined by using MaConkey and Salmonella by Shingella Agar. After preparation, the media were poured in petri dishes of 4" diameter and placed in an incubator for 24 hours at 37 °C to observe bacterial growth, if any.

After observing flow rate of ingesta, these birds were slaughtered, intestinal thickness was measured with the help of a Vernier calliper and their caecal samples were collected. From the pooled caecal sample, one gram was diluted in normal saline. Then the diluted sample (0.01 ml) was spread over both the dishes (MaConkey and Salmonella Shingella Agar) which were placed in an incubator. After 48 hours of incubation, petri dishes were examined and the number of colonies in each dish were counted.

RESULTS AND DISCUSSION

The average values for digestibility, intestinal thickness, flow rate of ingesta and bacterial loads of feed and caecal contents are summarized in Table 1.

Digestibility: The results revealed a highly significant ($P < 0.01$) effect of different feed additives on the dry matter and protein digestibility. However, the effect of weeks was highly significant ($P < 0.01$) on protein and significant ($P<0.05$) on dry matter digestibility (Table 2).

Table 2. Analysis of variance of data on dry matter, protein digestibility, intestinal thickness and flow rate of ingesta at 3rd, 6th and 8th weeks

		Mean squares of			
Sourece of variation	**Degree of freedom**	**Dry matter (%)**	**Protein digestibility (%)**	**Intestinal thickness (mm)**	**Flow rate of ingesta (min.)**
Treatment (T)	3	35.86**	36.55**	0.322**	786.03**
Week (W)	2	0.92*	0.45**	5.250**	24198.70**
T & W	6	1.105 N.S	0.47**	0.021 N.S	22.27 N.S
Error	24	0.17	0.074	0.021	33.76

**Highly signifcant ($P < 0.01$); *Significant ($P < 0.05$) ; N.S = Non – significant.

The paired comparison of means by Duncan's Multiple Range test showed that the percentage dry matter digestibility ranked in the following descending order as Gallamycin (92.66) , Erythro F – Z (91.26), Furazole (89.78) and Control (88.90) with significant diifferences among themselves. It was further observed that the dry matter digestibility increased with the increasing age when examined at 3rd, 6th and 8th weeks of age. The interaction between treatments and weeks was non–significant for dry matter but significant ($P < 0.01$) for crude protein digestibility (Table 2). Due to difficulty in the interpretation of results in the presence of significant interaction in case of protein, the data pertaining to 8th week of age were separately analysed which revealed significant ($P < 0.01$) effect of treatment on digestibility (Table 3).

Table 3. Analysis of variance of data on protein digestibility percentage at 8th week of age

Source of variation	Degree of freedom	Sum of squares	Mean squares	F. ratio
Treatment	3	30.35	10.120	389.23**
Error	8	0.21	0.026	

** = Significant ($P < 0.01$).

The comparison of means by Duncan's Multiple Range test revealed that protein digestibility was maximum in birds fed ration containing Gallamycin (93.91), followed by Erythro F – Z (92.39), Furazole (91.07)and Control (89.61) with significant differences among themselves. It was concluded that the digestibility of dry matter and crude protein was improved due to feed additives which then indirectly improved the efficiency of feed utilization. The results agree with the findings of (Valerani, 1980) who reported that the digestibility increased with Flavomycin.

Intestinal Thickness: The statistical analysis of data on intestinal thickness at 3rd, 6th and 8th weeks revealed a significant ($P < 0.01$) effect of feed additives and weeks with a non–significant interaction between the two (Table 2). The comparison of means further indicated that intestinal thickness increased with age, although there was non–significant difference between 6th and 8th week. The comparison of means by Duncan's Multiple Range test showed that mean difference in intestinal thickness between Control (3.00 mm) and Furazole (2.90 mm) groups was non–significant but both the groups showed significantly more intestinal thickness than groups fed Erythro F–Z (2.66 mm) and Gallamycin (2.46 mm) (Table 1). It was observed that although intestinal thickness increased with age but it could significantly reduce with the addition of feed additives to increase growth rate through better absorption. These results are in line with Henry *et al.* (1987) who reported significant reduction in small intestine weight by feeding antibiotics.

Flow Rate of Ingesta: The comparison of means by Ducan's Multiple Range test showed that significantly faster flow rate was found in birds fed control ration (186.00 minutes) followed by Furazole (200.66

minutes), Erythro F–Z (207.83 minutes) and Gallamycin (213.33 minutes). The flow rate of ingesta increased significantly with age of the birds. It was found that feed additives by lowering the flow rate, indirectly increased the growth rate through better absorption .

Bacterial Load: At the start of experiment, bacterial load for all the rations used i.e. D (Control) A (Erythro F–Z), B (Gallamycin) and C (Furazole) was 132120 x 10^5 , 127716 x 10^5 136524 x 10^5 and 92484 x 10^5 respectively. One randomly picked bird from each group during 3rd, 6th and 8th week of age was slaughtered and caecal contents were examined for Salmonella and *E. coli* load. The results revealed that group D (Control) had the maximum Salmonella load at 3rd, 6th and 8th weeks of age. At 3rd week of age the minimum load was shown by B and C groups, while at 6th and 8th weeks of age, the minimum load was observed in B group and A retained the intermediate level throughout the experimental period. The Salmonella load in C group increased during the 8th week of age. At 3rd, 6th and 8th weeks *E. coli* load was maximum in control group D. At the age of 3rd week the *E. coli* load among treatment groups was maximum in C and minimum in A groups. During 6th and 8th weeks among the treatment groups the maximum load was observed in C and minimum in B. It was concluded that caecal Salmonella and *E. coli* load could be reduced by the addition of feed additives in broilers. These results conform to those of Koopman *et al.* (1987).

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