

## EFFECTS OF FERMACTO FEEDING ON THE PERFORMANCE OF BROILER CHICKENS

Tahir Aziz, S. A. Khan, A. Raza, H. A. Hashmi<sup>1</sup> and M. Sarwar  
Pathology Section, <sup>1</sup>Parasitology Section, College of Veterinary Sciences, Lahore, Pakistan

### ABSTRACT

The effect of two levels of Fermacto feeding, for different durations, on feed conversion ratio and general metabolic state of broiler chickens by determining the functional and morphological state of liver and kidneys was studied. One hundred and five day-old broiler chicks were divided into seven groups viz A through G, each having 15 birds. Group A was kept as control. Fermacto was fed at two different levels (2 and 4 gm/kg of feed), and for different durations. The experimental period was 42 days. Organ body weight indices, FCR, gross lesions on liver and kidneys, serum glucose, serum cholesterol, serum total protein and serum uric acid levels were determined. The best FCR (2.3) was shown by recommended dose rate (2 gm/kg) from 7th day upto 42nd day of age. The morphological and functional state of liver and kidneys of all the birds appeared to be normal. It was concluded that Fermacto feeding had no deleterious effect on general metabolic state of broiler chickens.

### INTRODUCTION

Many feed additives are derived from fermentation processes using micro-organisms such as bacteria and fungi. These fermented products are of high nutritive value to poultry and are rich source of B-complex vitamins, proteins, minerals and unidentified factors (Ensminger *et al.*, 1983). These fermentation products increase feed efficiency and also provide buffer against diseases. Micro-organisms used in such products are used basically to control and promote the proper environmental conditions for the establishment of an ideal microbial population in an animal's digestive tract. One such type of fermentation product available in the market is Fermacto (Pet-Ag-Inc., 264 Keys Avenue, Hampshire, Illinois, 60140, USA). It is derived from *Aspergillus* species of fungus. The present study was designed to know the effect of two levels of Fermacto feeding for different durations on feed conversion ratio and general metabolic state of broiler chickens by determining the functional and morphological state of liver and kidneys.

### MATERIALS AND METHODS

One hundred and five day-old broiler chicks were reared under standard managemental conditions at experimental room, Pathology Section, College of Veterinary Sciences, Lahore.

On day 7, chicks were randomly divided into 7 groups viz A through G containing 15 birds each. Fermacto feeding to different groups was done in the

following pattern:

Group	Dose (g/kg) of feed	Feeding duration (Days)
A	0	Nil
B	2	7-42
C	4	7-42
D	2	21-42
E	4	21-42
F	2	35-42
G	4	35-42

Composition of Fermacto:

Protein	14.0 % minimum	Fat	1.0 % minimum
Fiber	34.0 % maximum	Ash	18.0 % maximum

Blood samples were collected from each bird of all groups at the time of slaughtering on 42nd day of age. Liver and kidneys of each bird of all groups were eviscerated, weighed and kept for pathological examination.

The following experimental studies were conducted:

- i. Organ: body weight index for each liver and kidney was ascertained as described by Giamborne and Closser (1990).
- ii. Feed conversion ratio (FCR) of each group was calculated as mentioned by Singh and Panda (1992).
- iii. Examination of liver and kidneys of all birds of all groups for gross pathological lesions.
- iv. Estimation of biochemical substances: The

following serum constituents were estimated by using commercial kits as described by Coles (1986): Total proteins, glucose, cholesterol and uric acid.

The data of all the groups was compared by analysis of variance and statistical differences among the various treatment means were determined by using DMR test at 5% level of probability as described by Steel and Torrie (1980).

## RESULTS

The results of organ body weight indices for each liver and kidney are presented in Table 1. Mean FCR were 2.50, 2.3, 2.75, 2.42, 3.00, 2.49 and 2.46 in the birds of groups A, B, C, D, E, F and G, respectively. The group B had the best FCR (2.30) and group E had the poorest (3.00).

Non-specific gross lesions, observed in liver and kidneys of birds of all groups, are presented in Table 2 and 3. Levels of serum biochemical substances are furnished in Table 4.

## DISCUSSION

The present study was designed to know the effect of two levels of Fermacto for different durations on feed conversion ratio and function and morphology of liver and kidneys of broiler chickens.

The highest left kidney: body weight index (5.62) was achieved in group E and highest mean right kidney: body weight index (5.45) was achieved in birds of group C. Jordanova (1979) reported that relative kidney weight was greater in chickens given additional lysine than in control. Similarly, relative kidney weight was significantly increased in chickens fed on aflatoxin and cyclopiazonic than in control (Smith *et al.*, 1992). The

results of our study are quite in agreement with the findings of above workers.

The highest mean liver: body weight index (33.32) was achieved in birds of group G. Liver weight increased in chickens fed on cystine, methionine and protein diet (Amubode and Fetuga, 1984). Liver weight was highest in chickens fed on 2.5 per cent fish oil, and 5 per cent animal fat than control (Tuncer *et al.*, 1987). The relative liver weight was significantly higher in chickens fed on aflatoxin and cyclopiazonic than in control (Smith *et al.*, 1992). The findings of our study are in agreement with the results of above workers. This could be due to the presence of lysine, methionine and protein in Fermacto which probably has enhanced the body metabolism of chickens which resulted in high organ:body weight indices.

The best feed conversion ratio (FCR) was achieved by the birds of group B (dose from 7th to 42nd). Vanbelle *et al.* (1988) and Huyghebaert and Pack (1993) reported that supplementary methionine significantly improved FCR in broiler chickens. The results of our study are quite in line with the findings of above workers. It is tempting to speculate that Fermacto feeding at recommended dose starting from 7th day has beneficial effect on body growth and also on digestion and absorption of nutrients. The beneficial effect of Fermacto feeding may be due to presence of arginine as reported by (Maria *et al.*, 1982). They reported arginine is known to be a limiting amino acid and a low proportion of arginine in the diet may influence weight gain not only directly but also indirectly. But the exact mechanism by which absorption of nutrients is increased, is not explored in this study. Further study to know the effect of Fermacto feeding on viscosity and movement of intestinal contents may elucidate mode of action of Fermacto in broiler chickens.

Table 1: Live body weight indices (Mean  $\pm$  SE) of experimental groups by fermacto feeding.

Groups	LkBix	RkBix	LBix
A	3.89 $\pm$ 0.06b	3.48 $\pm$ 0.13C	24.72 $\pm$ 0.19c
B	3.96 $\pm$ 0.07b	3.56 $\pm$ 0.06c	22.10 $\pm$ 0.59c
C	5.43 $\pm$ 0.24a	5.45 $\pm$ 0.20a	31.81 $\pm$ 0.58a
D	4.00 $\pm$ 0.12a	3.85 $\pm$ 0.12bc	25.71 $\pm$ 0.41bc
E	5.62 $\pm$ 0.12a	5.43 $\pm$ 0.24a	32.06 $\pm$ 0.89a
F	3.87 $\pm$ 0.04b	4.21 $\pm$ 0.12b	26.74 $\pm$ 0.56b
G	3.77 $\pm$ 0.06b	4.11 $\pm$ 0.06b	33.32 $\pm$ 0.57a

LKBix = Left Kidney: Body weight index

RKBix = Right Kidney: Body weight index

LBix = Liver: Body weight index

abcd = Any two means carrying the same letter in a column are not significantly different from each other at 5% probability level using DMR test.

Table 2: Gross pathological lesions in liver of broiler chickens with and without Fermacto feeding.

	Groups						
	A	B	C	D	E	F	G
Size							
Normal	+	+	-	+	-	+	+
Atrophy	-	-	+	-	+	-	-
Hypertrophy	-	-	-	-	-	-	-
Colour							
Normal	-	-	-	-	-	-	-
Discolouration							
Focal	+	+	-	+	+	-	-
Diffuse	-	-	+	-	-	+	+
Pale	-	-	-	-	-	-	-
Texture							
Normal	+	+	+	+	+	+	+
Soft	-	-	-	-	-	-	-
Hard	-	-	-	-	-	-	-
Any growth	-	-	-	-	-	-	-
Haemorrhages							
Petechinal	-	-	+	+	+	+	-
Streaks	+	+	+	-	-	-	+
Brush border	-	-	-	-	-	-	-
Deposition/covering of any material							
Fibrin	-	-	-	-	-	-	-
Fat	-	-	-	-	-	-	-

+ = Present

- = Absent

The gross pathological study of liver and kidneys revealed some non-specific lesions such as atrophy, little changes in colour, and streaks of hemorrhages in some birds. Gross lesions consisted of swollen kidneys congested with deposits of urates in ureters, mottling and ecchymotic hemorrhages were observed when broiler chickens were fed on diets molded with *Penicillium lanosum* and *Aspergillus parasiticus* containing different levels of aflatoxin (Arshad *et al.*, 1992). The gross lesions observed in our study are not characteristic of fungal infection and mycotoxicosis as reported by above workers. The non-specific lesions observed in some groups of chicks may be due to some managemental and environmental factors but it is difficult to establish their exact cause but it can be inferred that Fermacto is a quite safe product for broiler chickens.

The analysis of serum showed that highest glucose level (180 mg/dL) was observed in the birds of group G (Fermacto feeding at double dose) and lowest level (138 mg/dL) in birds of group A (control). Serum glucose was increased in chickens supplemented with fat (Balios and Poupoulis, 1992) and lysing and

methionine (Serban *et al.*, 1981). This may be due to the presence of fat, lysine and methionine in Fermacto which might had enhanced the serum glucose level as reported by Serban *et al.* (1981) and Balios and Poupoulis (1992). So it can be concluded that Fermacto has no harmful effect on the glucose synthesis activity of liver.

The highest value of serum cholesterol level (237 mg/dL) was observed in birds of group C and the lowest in group A (control). Serum cholesterol level was increased in chickens fed on 0.3 % added taurine (Lactera *et al.*, 1991) and diets containing supplementary aluminium and fat (Balios and Poupoulis, 1992; Szilagy *et al.*, 1993). Fermacto feeding resulted in increasing serum cholesterol level which might be due to presence of fat in Fermacto (Maria *et al.*, 1982).

The birds of all groups except C showed serum total protein level in normal range. According to Serban *et al.*, (1981) there was no significant difference in serum total protein in chickens in group given diets with lysine, methionine or both. Duneva and Dimitrova (1987) reported that serum total protein increased when

Table 3: Gross pathological lesions in kidneys of broiler chickens with and without Fermacto feeding.

	Groups						
	A	B	C	D	E	F	G
Size							
Normal	+	+	+	+	+	+	+
Atrophy	-	-	-	-	-	-	-
Hypertrophy	-	-	-	-	-	-	-
Colour							
Normal	+	+	+	+	-	+	+
Discolouration							
Focal	-	-	-	-	+	+	-
Diffuse	-	-	-	-	-	-	-
Pale	-	-	-	-	-	-	-
Texture							
Normal	+	+	+	+	+	+	+
Soft	-	-	-	-	-	-	-
Hard	-	-	-	-	-	-	-
Any growth	-	-	-	-	-	-	-
Haemorrhages							
Petechinal	+	-	+	+	-	-	+
Ecchymotic	-	-	-	-	-	-	-
Brush border	-	-	-	-	-	-	-
Deposition/covering of any material							
Fibrin	-	-	-	-	-	-	-
Fat	-	-	-	-	-	-	-

+ = Present      - = Absent

Table 4: Levels of serum biochemical substances (Mean  $\pm$  SE) of broiler chickens with and without Fermacto feeding.

Groups	Glucose (mg/dL)	Cholesterol(mg/dL)	TotalProtein (g/dL)	Uric Acid (mg/dL)
A	138.27 $\pm$ 2.4d	118.27 $\pm$ 5.80d	5.71 $\pm$ 0.27a	6.54 $\pm$ 0.14
B	151.67 $\pm$ 3.7c	119.73 $\pm$ 5.30d	5.27 $\pm$ 0.27ab	6.37 $\pm$ 0.14
C	162.87 $\pm$ 3.3bc	237.93 $\pm$ 8.10a	3.60 $\pm$ 0.25c	6.47 $\pm$ 0.16
D	177.27 $\pm$ 4.1a	125.47 $\pm$ 6.30c	4.90 $\pm$ 0.24ab	6.53 $\pm$ 0.13
E	161.87 $\pm$ 4.4bc	154.07 $\pm$ 5.70b	4.67 $\pm$ 0.34b	6.44 $\pm$ 0.26
F	172.67 $\pm$ 5.4ab	129.80 $\pm$ 6.40c	5.81 $\pm$ 0.25ab	6.76 $\pm$ 0.16
G	180.20 $\pm$ 3.90a	128.0 $\pm$ 6.20c	5.54 $\pm$ 0.42ab	6.65 $\pm$ 0.14

Any two means carrying the same letter in a column are not statistically different from each other at 5% probability level using DMR test.

chickens were fed crude protein and vitamin A. The results of this study are quite similar to the findings of Serban *et al.* (1981). The increase in total serum protein observed by Duneva and Dimitrova (1987) may be due to the nature of crude protein or synergistic effect of crude protein and vitamin A but in Fermacto amino acids are present without combination of vitamin

A. So it can be thought that Fermacto feeding has no harmful effect on the protein synthesis activity of liver.

The results of serum uric acid level of all the groups have no statistical difference with one another which reflected the functional activity of the kidneys of these chickens is normal. Saoud and Daughir, 1980 and Poo and Millan (1990) also observed non-significant

difference in serum and plasma uric acid level in broiler chickens fed on feed supplemented with yeast protein. The results of our study are in concurrence with the findings of Saoud and Daughir (1980) and Poo and Millan (1990). But according to Mohiuddin *et al.* (1993) the level of serum uric acid increased due to toxic effects of ochratoxin (fungal toxin) on kidneys of the birds. So it can be assumed that Fermacto has no harmful effect on functional activity of kidneys and can be used as a safe feed additive.

It can be concluded from this study that Fermacto feeding at dose rate of 2 gm/kg of feed from 7th day upto 42nd day in broiler chickens. Moreover, on the basis of this work it can also be inferred that Fermacto is an effective, safe and non toxic feed additive for commercial broiler chickens.

## REFERENCES

- Amubode, F.O. and B.L. Fetuga, 1984. Hepatic xanthine dehydrogenase and plasma uric acid in broiler chickens fed various amounts of dietary methionine protein energy. *J. Agri. Sci.*, 103 (3): 497-502.
- Arshad, S., M.Z. Khan, M. Siddique, M.T. Javed and H.A. Khan, 1992. Clinico-pathological studies of experimentally induced mycotoxicosis in broiler chickens. *Pakistan Vet. J.*, 12 (4): 183-185.
- Balios, J. and Poupoulis, 1992. Effect of biotin on the fatty acid composition of abdominal fat, liver fat and blood serum fat of broiler fed high fat diets. *Proc. 19th World's Poultry Cong.*, Amsterdam, Netherlands, 19-24 Sept. Vol. 1, pp: 594-597.
- Coles, E.H., 1986. *Veterinary Clinical Pathology*, 4th Ed., W.B. Saunders Company, U.S.A., pp: 139-193.
- Duneva, N. and E. Dimitrova, 1987. Effect of the amount of crude protein and vitamin A mixed in feeds for breeding broiler chickens on immunity stress for Newcastle disease. *Zhivotnovodni. Nawki*, 24 (12): 86-93.
- Ensminger, E.M., J.E. Oldfield and W. Heinemann, 1983. *Fermentation byproducts. Feeds and Nutrition Digest*, 2nd Ed., The Ensminger Publishing Company, California, pp: 122.
- Giamborne, J.J. and J. Closser, 1990. Efficacy of live vaccine against serologic subtypes of infectious bursal disease. *Avian Dis.*, 34 (7): 7-11.
- Huyghebaert, G. and M. Pack, 1993. Influence of protein concentration on the response of broilers to DL-methionine. *Zootecnia Int.*, 16 (10): 41-46, 48-49.
- Iordanova, V., 1979. Effect of different amounts of lysine in diets for chickens. *Veternarnomeditsinski Nauki*, 16 (8): 10-15.
- Lactera, N.G., A.V. Supplizi, A. Novelli, N.M. Haouct and C. Pieramati, 1991. Further study on the effects of dietary taurine on growth, serum and muscle cholesterol level of chicks. *Zootecnia Int.*, 9: 52-54.
- Maria, A.E.M., C.D. Renee, H.M.T. Anthony and E.W. Cline, 1982. Effect of dietary protein and cholesterol on cholesterol concentration and lipoprotein pattern in the serum of chickens. *J. Nut.*, 112: 1029-1037.
- Mohiuddin, S.M., S.M.A. Warasi and M.v. Raddy, 1993. Haematological and biochemical changes in experimental ochratoxicosis in broiler chickens. *Indian Vet. J.*, 70 (9): 613-617.
- Poo, M.E. and Millan, 1990. Effect of dietary concentration of yeast (*Saccharomyces carlsbergensis*) recovered from beer, in male Warren chicks. *Archives Latinoamericanas de Nutricion*, 40 (1): 95-106.
- Saoud, N.B. and N.J. Daughir, 1980. Blood constituents of yeast fed chicks. *Poult. Sci.*, 59 (8): 1807-1811.
- Serban, M., A. Lozinschi, M. Suteanu and A. Dexamir, 1981. Biochemical components in blood serum of meat chickens given diets with synthetic amino acids. *Inst. Agronomic, Nicloac Balceslu, Bucharest, Romania*, 23: 57-62.
- Singh, K.S. and B. Panda, 1992. *Feed efficiency. Poultry Nutrition*, 2nd Ed. Kalyam Publishers, Rajinder Nagar, Ludhiana, India, pp: 199.
- Smith, E.E., L.F. Kubena, C.E. Braithwaite, R.B. Harvey, T.D. Philips and A.H. Reine, 1992. Toxicological evaluation of aflatoxin and cyclopiazonic acid in broiler chickens. *Poult. Sci.*, 71 (7): 1136-44.
- Steel, R.G.D. and J.H. Torrie, 1980. *Principles and Procedures of Statistics*. 2nd Ed. McGraw Hill Book Co. Inc. New York.
- Szilagyi, M., J. Bokoria and S. Fekete, 1993. Dietary aluminium effects on serum parameters in chickens. *Proc. English Int. Symp. Trace Elements in Man and Anim. Gersdorf, Germany, Verlag Media Touristik*, pp: 705-708.

- Tuncer, S.D., R. Asti, B. Coskun, H. Erer and M.A. Tekes, 1987. The effect of different energy sources on growth performance abdominal fat deposition and fatty liver syndrome in broilers. *Veteriner Fakiltesi Dergisi Selcuk Universitesi*, 3 (1): 41-61.
- Vanbelle, M., A. Baudichau and D.C. Bruyer, 1988. Methionine in liquid or powder form: Some efficiency in broilers, *Rivista di Avicoltura*, 57 (9): 97-99.