

Effect of Different Feed Restriction Programs in Broilers on Parameters of Blood Biochemistry

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In the study, the effects of different feeding programs on some blood biochemistry and tonic immobility durations in Ross 308 broilers were investigated. When aged 7 d, 60 chicks were divided into three groups to this end as AD, FR and NF in such a way that each group contained 20 birds. The tonic immobility durations, some parameters of blood biochemistry and the H:L ratios, by utilizing the heterophil and lymphocyte counts were determined. As a result of the analysis of variance carried out, it was observed that the H:L ratios of the birds in group NF were higher than those of the birds in groups AD and FR ($p = 0.031$). No statistically significant difference existed between the tonic immobility durations of the birds in groups AD and FR ($p > 0.05$) whereas it was observed that the tonic immobility durations of the birds in group NF were clearly higher than those of the groups AD and FR ($p = 0.021$). Starting from these findings, it was concluded that increasing the duration of feed restriction caused a serious level of stress on birds.

Key Words: Restricted feed, Broiler, H:L Ratios, Tonic immobility duration, Blood parameters.

INTRODUCTION

With a view to reducing metabolic problems such as the skeletal system deformations, foot-leg problems, increase in sudden deaths, over fattening in ascites and carcasse, which occur upon rapid growth in broilers and to controlling growth, researchers applied¹⁻¹¹ for different feed restriction applications in early periods. These applications cause fear and stress in birds^{12,13}. Hence, growth rate at the early age is slowed and priority is given to the growth of the skeletal system and vital organs. Currently, an increase has been observed in the applications towards welfare in animal raising.

Jones¹⁴ reported that the tonic immobility may be used as a reliable criterion in determining the state of fear in poultry. Birds with high tonic immobility values were reported to be more fearful¹⁵⁻¹⁹. Tonic immobility is influenced by the genetic structure of birds, housing condition and management

applications. Numerical and proportional variations in leukocytes known as white blood cells are also used as reliable criteria in determining fear and stress in poultry²⁰⁻²⁷. Gross and Siegel²⁰ reported that the heterophil: lymphocyte (H:L) ratio is an important criterion for chronic stress and that the H:L ratio increases in the event of stress. However, Maxwell *et al.*²⁸ stated that although heterophilia occurs under the conditions of stress at medium level, heteropenia and basophilia may develop in the event of extreme stress. Therefore, tonic immobility values and H:L ratio can be considered as essential indications in determining whether housing condition and management applications are suitable for animal welfare.

This study was carried out with a view to investigate the effect of different feeding programs on some parameters of blood biochemistry, tonic immobility durations and H:L ratios in broilers.

EXPERIMENTAL

60 Ross 308 male chicks constituted the material of this study. When aged 7 d, these chicks were divided into three groups as AD, FR and NF in such a way that each group contained 20 birds. The birds in group AD were applied *ad libitum* feeding while the birds in group FR were given 20 % less feed than the feed given to the birds in group AD between the 7th and 21st days. The birds in group NF were not presented any feed between 09:00 a.m. and 15:00 p.m. between the 7th and 21st days. The tonic immobility durations of these birds were detected between the 7th and 21st days when feed restriction was applied. Meanwhile, 10 birds were chosen randomly from each group at the end of the experiment (on the 43rd day) and blood samples were drawn from them and some blood parameters (leukocyte) were determined.

Blood samples were drawn from under-wing vein (*v. cutane ulnaris*). The quantities of white blood cells and H:L ratio were detected in the blood samples drawn. In counting white blood cells, the blood drawn from birds by means of a syringe was spread on a slide. After it dried, it was fixed by methanol and stained by Wright's dye. When it dried following buffering and washing, it was treated with xylol and then it was covered by entellen and made ready for reading by a microscope. The lymphocyte, heterophil, eosinophil, basophil, monocyte cells in 100 leukocyte cells counted under microscope were detected. H:L ratio was calculated by proportioning the heterophil count to the lymphocyte count²⁰.

Daily, 23 h light and 1 h dark (23A:1K) lighting program was applied in the study. So as to meet the feed and water needs of birds, round feeders and nipple drinkers were used. Thermostat electric stoves were used for heating the experimental divisions.

The individual live weights of birds, their feed consumptions at group level and their feed conversion ratios were determined weekly. Feed conversion ratios were calculated as the amount of feed consumed per unit live weight increase (g feed consumption/g CAA). Deaths were recorded daily. Deaths were taken into consideration in the calculations of feed consumption.

The chicks in the experiment were fed with broiler starter feed (23 % protein, 3100 kcal/kg) between 0 and 14th days, broiler growth feed (20 % protein, 3000 kcal/kg) between 15th and 28th days and broiler finisher feed (19 % protein, 3150 kcal/kg) from the 28th day until being slaughtered.

One-way analysis of variance was used to compare the groups. Duncan's multi-comparison test was used in determining different groups²⁹.

RESULTS AND DISCUSSION

When the effects of the applied feeding programs (AD, FR and NF) on blood parameters are examined, it is observed that groups AD and FR are quite similar in terms of other parameters apart from eosinophil (Table-1). On the other hand, the birds in group NF have lower values in comparison to the birds in groups AD and FR in terms of other blood parameters apart from eosinophil ($p = 0.00$).

TABLE-1
DESCRIPTIVE STATISTICS BY FEEDING REGIMES IN TERMS OF
SOME BLOOD BIOCHEMISTRY PARAMETERS

Parameters	AD	NF	FR
	Mean±SE Mean	Mean±SE Mean	Mean±SE Mean
Lymphocyte	200.300±1.730 a	31.700±1.450 b	198.700±1.510 a
Basophil	17.100±0.940 a	9.900±0.550 b	13.100±0.840 ab
Heterophil	34.700±1.440 a	6.500±0.370 b	37.700±1.100 a
Monocyte	31.600±3.000 a	14.400±1.240 b	25.700±1.740 a
Eozinophil	22.200±1.040 a	17.600±1.220 b	15.000±0.760 b
Heterophil:Lymphocyte	0.171±0.006 b	0.226±0.023 a	0.187±0.006 b

It was observed that the H:L ratios of the birds in the group (NF), which was not presented any feed between 09:00 a.m. and 15:00 p.m., were higher in comparison to the birds in groups AD and FR ($p = 0.031$). These findings can be accepted as an indication that the birds in group NF suffer from more stress than the birds in groups AD and FR. On the other hand, it is striking that the H:L ratios of the birds in groups AD and FR are quite similar to each other (Table-1, $p > 0.05$). Thus, *ad libitum* feeding or application of 20 % feed restriction forms a similar level of stress on birds. In this case, it is possible to make a recommendation to raisers towards applying for a 20 % feed restriction instead of an *ad libitum* feeding since

both the live weights at slaughtering age of birds in groups AD and FR (Fig. 1) and their feed conversion ratios (1.96 and 1.70) were also found to be quite close to each other. It is possible to reach similar results also by setting off from tonic immobility durations since no statistically significant difference was found between tonic immobility durations of the birds in groups AD and FR ($p > 0.05$) whereas it was observed that the tonic immobility durations of the birds in group NF were clearly higher than those of groups AD and FR ($P = 0.021$; Table-2). Even though the findings of this study generally support the findings of the earlier studies¹⁵⁻¹⁹, several differences were observed as well with the studies concerned. It can be put forward that these differences may be caused by the fact that the experimental conditions considered in the studies were different.

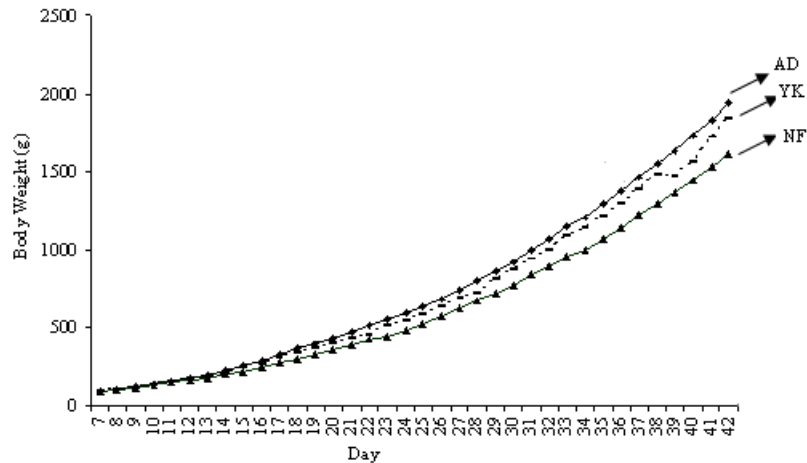


Fig. 1. Growth curves by groups

TABLE-2
EFFECT OF DIFFERENT FEEDING APPLICATIONS
ON TONIC IMMOBILITY

Feeding regimes	Mean \pm SE Mean
AD	8.87 \pm 1.95 b
NF	13.29 \pm 3.05 a
FR	8.82 \pm 2.52 b

It is possible to conclude that not only the changes in the quantities of feed but rather possible changes in feeding durations cause more stress on birds. As a result of this, both a decline occurs in feed conversion ratios of birds concerned and the desired level is not reached in their slaughtering weights. This not only negatively affects animal welfare but also causes economic losses.

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