ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

International Journal of Poultry Science 6 (4): 280-282, 2007
ISSN 1682-8356

Effect of Different Levels of Diet Dilution During Finisher Period on Broiler Chickens Performance and Carcass Characteristics

Mahmood Sahraei[1] and Farid Shariatmadari[2]
[1]Department of Animal Sciences, University of Tarbiat Modarres, Tehran, Iran
[2]University of Tarbiat Modarres, Tehran, Iran

Abstract: This experiment was conducted to compare the effects of diet dilution with sand and wheat bran (wt:wt) on broiler chicken performance and carcass characteristics during finisher periods from 35 to 45 ages. Hence one Completely Randomized Design (CRD) that include different levels of finisher diet diluted with sand and wheat bran (wt:wt) (in levels 7, 14, 21 or 28%) and one control group (undiluted finisher diet) in 5 treatment with four replicate each containing five male broiler chicken (total 100 birds) of arain strain. Comparing means levels of diet dilution with control birds showed that feed intake in different levels was more than control birds ($p<0.01$). But live weight (at 45 ages), body weight gain only in 28% levels were less than control birds ($p<0.01$). Carcass weight in 28 and 21% levels and abdominal fat percent in 14, 21 and 28 levels were significant difference with control birds ($p<0.01$). However percentage of breast and thigh at all levels of diet dilution except of 7% level were less than control birds ($p<0.01$).

Key words: Broiler chicken, diet dilution, finisher period

Introduction

Constant improvement in nutrition and genetic selection, has led to a fast growth rate in modern broiler strains. Over the last 20 years the time required to grow a broiler chicken to 2 kg has decreased (from 63 days to 37 days) nearly by half (Van Der Sluis, 1999). Unfortunately this growth rate is accompanied with increased body fat deposition, high mortality and high incidence of metabolic diseases and skeletal disorders (Zubair and Leeson, 1996). These situations most commonly occur with broilers that consume feed *ad libitum* (Pasternak and Shalev, 1983; Nir *et al*., 1996). Thus feed restriction (in diet dilution methods) has been proposed to reduce these problems. Therefore upon this topic Leeson *et al*. (1996) reported that broiler fed with finisher diet diluted with sand and oat hulls in levels of 10,20,30,40 and 50% and use of these diets from 35 to 49 days, affected the percentage of abdominal fat, breast and carcass weight. Also other experiment result show that energy restriction in late 10 days of finisher period has led to reduce abdominal fat percent (Arafa *et al*., 1983). Research showed that use of feed restriction in finisher period has led to reduce abdominal fat percent and improvement feed conversion ratio in broiler chicken (Washburn, 1990). Alternatively, feed restriction could be applied at the end of the growing period. It is claimed that feed restriction at the end of the growing period is a better means of checking broiler growth performance (Benyi and Habi, 1998). This experiment was designed to compare the effects of different diet dilution levels at late 10 days of finisher period on broiler chicken performance and carcass characteristics.

Materials and Methods

In this experiment one hundred 35-d-old male broiler chickens of Arain strain were located in cage system and randomly allocated to one of five treatment groups with four replicated each containing five birds. All birds received the same starter diet to 16 d of age, at which time the grower diet was introduced and fed until 35d. On day 35, all birds were weighted individually and average for each treatment (cage) computed. Bird numbers per cage were fixed at 20 and mean cage body weight equalized. Diet treatment was applied at this time. Five finisher diets (Table 1) were formulated such that Treatment 1 was a standard broiler finisher, whereas Diet 2 through 5 involved 7 to 28% dilution of diet. This dilution was accomplished by substitution of all major ingredient for a 50:50 (wt:wt) mixture of sand and wheat bran. All diets were available for *ad libitum* consumption. All diets were formulated to meet the nutrient requirements according to NRC (1994). During the experiment weight gain, feed intake and feed conversion ratio were measured. Mortality was measured throughout the experiment. At the end of the experiment (45d) average live weight was measured in all treatment and 1 bird from each replicate (4 birds of each treatment) with body weight close to the replicate average selected for carcass analyses. After feed withheld for 9h, the selected birds were transported to the university pilot for processing.

In this experiment was arranged as completely randomized designs with cage as the experimental unit. Data of this experiment were analysis of variance using General Linear Model (GLM) procedures (SAS Institute, 1990). Difference among treatment were separated by Duncans Multiple Range Test.

Table 1: Composition and calculated nutrients composition of experimental diets

	Diet(%)				
Ingredients	1 (control)	2	3	4	5
Corn	50	47	47	44.3	42
Soybean meal (44%CP)	21	18.5	16	14.7	10
Wheat	18	17.9	15.1	15.3	16.7
Fish meal (64%CP)	4	2.5	2	0.85	0.8
Soybean oil	3.5	3.8	2.8	1.15	0
Wheat bran and sand (wt:wt)	0	7	14	21	28
Oyster shell	1.3	1.2	1.1	1	0.9
Monocalcium Phosphate	1.2	1.1	1	0.9	0.8
Sodium chloride	0.2	0.2	0.2	0.2	0.2
DL-Methionine	0.15	0.15	0.15	0.05	0
L-Lysine-HCl	0.075	0.15	0.15	0.05	0
Vitamin-Mineral premix	0.5	0.5	0.5	0.5	0.5
Calculated composition					
Crude protein (%)	18.0	16.26	15.1	14.12	12.51
Metabolizable energy (kcal/kg)	3120.0	2990.0	2790.0	2550.00	2350.00
Calcium (%)	0.92	0.8	0.73	0.63	0.57
Available phosphorus (%)	0.47	0.42	0.39	0.34	0.32
Sodium (%)	0.23	0.10	0.11	0.10	0.10
Curds Fiber (%)	3.1	3.25	3.45	3.64	3.76
Methionine (%)	0.41	0.44	0.41	0.29	0.21
Methionine-Cystine (%)	0.69	0.68	0.65	0.51	0.42
Lysine (%)	1.05	0.92	0.84	0.69	0.54

Table 2: Effect of diet dilution in the finisher period on feed intake, body weight gain, feed conversion ratio and live weight at 45d

Diet treatment (Percentage dilution) (%)	Feed intake 35 to 45 (g/bird)	Body weight gain 35 to 45 (g/bird)	Feed conversion ratio 35 to 45 (g:g)	Live weight at 45d (g)
1(0)	1350^{d}	600^{a}	2.25^{a}	2000^{a}
2(7)	1400^{c}	600^{a}	2.33^{a}	1985^{a}
3(14	1450^{b}	570^{ab}	2.54^{ae}	1960^{a}
4(21)	1500^{a}	540^{ab}	2.77^{bce}	1940^{a}
5(28)	1525^{a}	510^{b}	3^{dc}	1910^{b}
Treatment effect	**	**	**	**
CV	1.46	3.86	6.22	1.96

Means within columns with no common superscripts differ significantly, **significant difference ($p<0.01$)

Table 3: Effect of diet dilution in the finisher period on carcass characteristics of broilers

Diet treatment (Percentage dilution)	Carcass weight[1] (g)	Abdominal fat percent (%CW)	Breast (%CW)	Thighs (%CW)
1 (0)	1451^{a}	2.86^{a}	30.25^{a}	38.32^{a}
2 (7)	1420^{ab}	2.18^{ab}	30.48^{a}	35.32^{a}
3 (14)	1397^{ab}	2.08^{b}	27.58^{b}	30.08^{b}
4 (21)	1371^{b}	1.82^{b}	26.86^{bc}	28.88^{b}
5 (28)	1338^{b}	1.65^{b}	25.62^{c}	27.68^{b}
Treatment effect	**	**	**	**
CV	2.3	24.03	6.54	7.84

1. Eviscerated carcass weight, Means within columns with no common superscripts differ significantly, **significant difference ($p<0.01$)

Results and Discussion

Effect of diluted diets on feed intake, body weight gain, feed conversion, live weight at 45d and carcass characteristics are presented in Table 2 and 3.

During the period of diet dilution, birds attempted to maintain nutrient intake by consuming more feed, thus increasing degrees of diet dilution resulted in graded increase in feed intake (Table 2). Results of this experiment are in agreement with the finding of other studies (Leeson *et al.*, 1996,1992). With increasing of diet dilution there was a significant reduction in body weight gain in treatment 5 because with increasing diet dilution (treatment 5) birds could not obtain the nutrients that necessary for the normal growth and reduce growth rate with diluted diets more likely related to differential partitioning of retained energy. Also with increasing of diet dilution feed conversion ratio in treatments 4 and 5 was more than control birds. Results of this experiment are in agreement with the finding of other studies (Leeson *et al.*, 1996,1992). Live weight at 45d only in treatment 5 was less than other treatments, because decreasing in nutrient density at 28% level of diet dilution

has led to reduction in normal growth. Presented results in (Table 3) showed that with increasing of diet dilution, carcass weight in treatments 3, 4 and 5 were significantly lower than other treatments, this situation maybe related to higher feeding of diluted diet and to the enlargement of the gastrointestinal tract. Results of this experiment are in agreement with the finding of other studies Arafa *et al*. (1983). Percentage of thighs and breast in treatments 3, 4 and 5 were significantly lower than other treatments. This is in contrast with the findings of Leeson *et al*. (1996). With increasing of diet dilution there was a significant reduction in abdominal fat pad percent in treatment 3, 4 and 5 than other treatment. But there is no significant difference between of treatment 2, 3, 4 and 5. Results of this experiment are in agreement with the finding of other studies (Leeson *et al*., 1996,1992; Arafa *et al*., 1983; Benyi and Habi, 1998). In this experiment when nutrient diet was diluted, birds were not able to maintain constant intakes of energy for supply of energy requirement for maintenance and growth, therefore were forced to consume of carcass energy deposition such as abdominal fat. Also broiler fed diluted diets consume much more feed and this means that birds must expend more energy in eating and digesting diluted diet. Working with laying hens Van Kampen (1976) suggested that the physical act of eating represented about 3% of daily heat production. Because the broiler chicken normally eats proportionally more feed than does the Leghorn, this value is expected to be higher for broilers and particularly so when feed intake is increased even further by diet dilution. In conclusion, diluted finisher diet could be used as the means for reduction of fat deposition in carcass and improvement of broiler chicken performance.

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