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INFLUENCE OF VARYING LEVELS OF BERGAFAT ON PERFORMANCE OF BROILER CHICKS

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ABSTRACT

The present study was conducted to examine the effect of bergafat HTL-306 on feed intake, live weight gain, organ characteristics and feed cost analysis of broilers in a completely randomized design. Four *iso-caloric* and *iso-nitrogenous* broiler starter and finisher diets were formulated using 0 (control), 2, 4 and 6% levels of bergafat. One hundred and twenty day old broiler chicks were divided randomly into twelve experimental units of ten chicks each. Each experimental diet was fed to three replicates. Broiler starter diets were fed during 0-4 weeks while finisher diets during 5-6 weeks of age. At the end of the experiment, two chicks from each replicate were slaughtered to determine the organ characteristics. It was observed that live weight gain and feed conversion ratio were significantly ($p<0.05$) better in birds fed diets containing 4 and 6% bergafat. Dressing percentage increased significantly ($p<0.05$) while average visceral fat percentage decreased significantly ($p>0.05$) with supplementation of bergafat in the diet. Feed cost/kg live weight gain was lower in birds fed diets containing 4% bergafat. In conclusion supplementation of bergafat in broiler diets up to 4% resulted in improved live weight gain and economical broiler production.

Key words: Broiler, bergafat, growth performance, organ characteristics, feed cost analysis.

INTRODUCTION

Poultry diet is formulated primarily on the basis of energy needs (NRC, 1994). Supplementation of fat has become a normal practice in increasing energy density of broiler's diets (Squires *et al.*, 1991) owing to its high caloric value. Moreover, it lowers dustiness and elevates fat soluble vitamins contents in the diet (Zollitscha *et al.*, 1997; Odunsi and Onifade 1998).

Quality of fat has a great contribution to get better poultry growth and feed efficiency which depends upon chemical nature of the constituent fatty acids (Ketels and De Groote, 1989; Danicke *et al.*, 2000). Vegetable fats are rich in polyunsaturated fatty acids, better digested and absorbed than animal's fats which are rich in saturated fatty acids (Danicke, *et al*., 2000). It is well known that supplementation of vegetable fats has beneficial effect on weight gain and feed efficiency than animal fats (Brenes *et al.*, 1993; Odunsi *et al.*, 2007; Preston *et al.*, 2001) due to the provision of essential fatty acids (Leeson and Summers, 2001). The rigid exclusion of fat from the diet of growing chicks resulted in growth retardation, presumably, due to deficiency of essential fatty acids (NRC, 1994).

Bergafat HTL-306 is a palm oil derivative, activated with special lecithin fractions and available in powdered form. It has high melting point, which reduces the chances of rancidity. Furthermore, it can be mixed homogeneously, thoroughly and easily in the feed during its preparation. Keeping in view all these aspects of fats supplementation in the diet, an experiment was conducted to examine the effect of bergafat (HTL-306) on the weight gain, carcass characteristics and economics in broiler chicks.

MATERIALS AND METHODS

The study was conducted at Poultry Research Center, University of Agriculture, Faisalabad, Pakistan, to examine the effect of supplementation of bergafat (HTL-306) on weight gain, carcass characteristics and economics. Four *iso-caloric* and *iso-nitrogenous* broiler starter and finisher diets were prepared having 0 (Control), 2, 4 and 6% bergafat and were designated as A, B, C and D, respectively. All diets were formulated to meet the nutrient requirements of chicken (NRC, 1994). The ingredients and nutrients composition of broiler starter and finisher diets is shown in Table 1, 2.

One hundred and twenty day-old broiler chicks (Hubbard) were purchased from the local market. The chicks were randomly distributed into 12 experimental units in such a way that each diet was offered to three experimental units comprising 10 chicks each. These chicks were marked for identification. Standard management practices for commercial broiler production were applied. Chicks were vaccinated against New-castle disease at 5 and 25 d of age and Infectious Bursal Disease at 9, 19 and 29 d of age.

The study was lasted for 6 weeks, 0-4 weeks for starter phase while 5-6 weeks for finisher phase. All the experimental birds were weighed at the start of the trial and at weekly interval, thereafter. All the groups were fed the allotted diets *ad libitum* and daily offered and refused feed were weighed. At the end of each week, feed intake was recorded. The feed intake and weight gain were recorded separately for starter and finisher phase. Feed conversion ratio (FCR) was also calculated for starter and finisher phase. Cumulative data of feed intake, weight gain and FCR was used to calculate the cost per kg of live weight gain.

At the end of the experiment, two birds from each experimental unit were picked up randomly. These birds were slaughtered to determine the dressing percentage, weights of liver, gizzard, heart, pancreas and visceral fats.

The proximate analysis of feed was done to determine the percent N (Kjeldhal method; AOAC, 1990). The CP contents were calculated by multiplying N% with factor 6.25 (AOAC, 1990). Crude fiber was determined by AOAC (1990) protocol. The metabolizable was calculated according to NRC (1989). The Ca contents were analyzed via atomic absorption spectrophotometry (Model 4, Perkin-Elmer, Norwalk) and P was analyzed photometrically via Spectronic 1001 (Milton Roy Co., Cincinnati, OH).

The data were analyzed using analysis of variance technique with completely randomized design. The significance of differences among the treatment means were compared by Duncan's Multiple Range tests (Steel *et al.,* 1997).

RESULTS AND DISCUSSION

Supplementation of bergafat in the diet significantly ($p<0.05$) increased the weight gain of birds than control during starter phase but non-significant ($p<0.05$) effect during finisher phase (Table 3). Increased weight gain with bergafat supplementation was in concordance with Nitsan *et al.* (1997) who reported that supplementation of 3% soybean oil in the diet improved weight gain in birds than those fed diets without soybean oil. Odunsi *et al.* (2007) also reported that supplementation of vegetable oil in the diet improved weight gain in chickens compared with those fed diets without oil. Supplementation of soybean oil in the diet stimulates growth rate of chickens (Carew *et al.*, 1961). This is due to the reason that supplementation of oil in the diet increases energy density, reduces dustiness and increases certain vitamins concentration in diets (Abawi *et al.*, 1985; Odunsi, and Onifade, 1998; Zollitscha *et al.*, 1997). Moreover, it also provides essential nutrients like linoleic acid (Leeson and Summers, 2001).

Feed intake was significantly ($p<0.05$) higher in birds fed diets containing bergafat during starter and finisher phases (Table 3). Increased feed intake might be due to reduced heat of increment as a result of bergafat supplementation. Similar findings were also reported by Fuller and Mora (1973) and Lipstein and Bornstein (1975). Soren *et al.* (2009) observed non-significant on feed intake in birds fed basal diet supplemented with lipid sources. Contrary to these, Tabeidian *et al.* (2005) reported that inclusion of 7.5% soybean oil resulted in the lowest feed intake which might be due to poor fat digestion in young broiler chickens (Leeson and Summers, 2001). Ali *et al.* (2001) also reported that feed intake of the broilers fed 10% soybean oil in the diet was significantly lower than the broilers fed diets with lower levels of soybean oil. This might be due to the reason that high oil contents decreased stomach emptying through stimulation of entrogastrine secretion from intestine, reducing feed intake.

Table 1: Percent ingredients and chemical composition of broiler (0-4 weeks) starter diets

Diet Ingredients	A	B	C	D
Maize	32	28	25	21
Wheat bran	0	4	8	12
Rice	18	18	18	18
Rice polishing	10.45	8.45	5.45	3.45
Canola meal	3	3	3	3
Soyabean meal	13.5	13.5	13.5	13.5
Cottonseed meal	6	6	6	6
Corn gluten meal 30% (CP)	3	3	3	3
Corn gluten meal 60% (CP)	5	5	5	5
Fish meal	5	5	5	5
Bergafat	0	2	4	6
Molasses	2	2	2	2
DCP	0.75	0.75	0.75	0.75
Limestone	0.75	0.75	0.75	0.75
Vitamin/mineral premix[1]	0.5	0.5	0.5	0.5
L-Lysine	0.03	0.03	0.03	0.03
DL-Methionine	0.02	0.02	0.02	0.02
Composition (%)				
Crude protein	21.70	21.74	21.75	21.79
ME (Kcal/kg)	3007	3011	3015	3019
Crude fiber	4.80	4.90	4.90	5.01
Ca	0.93	0.93	0.94	0.94
Available P	0.40	0.41	0.41	0.41

[1]Composition of vitamin/mineral premix: Vit. D = 100000 I.U., Vit. E =300 I.U., Fe=1000 mg, Co=15 mg, Cu=600 mg, I=400 mg, Zn=3000 mg, Mn=20000 mg, Se=3 mg, Na=4.5%, Mg=5.5%, Ca=15.5%, P=14.2%

Feed conversion ratio was better in birds fed diets containing bergafat than those birds fed control diet (Table 3). These finding are in accordance with the study of Daghir and Tannous (1965) who found that

supplementation of fats in the diets significantly improved FCR of the birds. Khan *et al.* (2003) also reported improved FCR through supplementation of bergafat in broiler's diet. Contrary to these, Oertel and Hortfiel (1983) observed non-significant difference in FCR among birds fed diets with or without oil. Feed cost/kg live weight gain was 21.89, 22.53, 18.54 and 19.87 in birds fed diets containing 0, 2, 4 and 6% bergafat for 0-6 week (Table 3). This indicates that supplementation of 4% bergafat in the diet resulted in economical broiler production compared to all other diets.

Dressing percentage was higher ($p<0.05$) in birds fed diets containing bergafat than those fed control diet. However, there was non-significant difference across all treatments containing bergafat. Average visceral fat percentage decreased with increasing the levels of bergafat in the diet. Maximum (4.37) and minimum (3.35) average visceral fat percentage was observed in birds fed diets A and C, respectively. Weight of internal organs i.e. heart, liver and gizzard remained unaltered across all treatments. Sadeghi and Tabiedian (2005) reported that supplementation of varying levels of fat had non-significant effect on carcass, abdominal fat and liver weight. Tabiedian *et al.* (2005) also noticed that addition of soybean oil in the diet had non-significant effect on carcass and pancreas weight.

Table 2: Percent ingredients and chemical composition of broiler (5-6 weeks) finisher diets

Diet Ingredients	A	B	C	D
Maize	37	37	37	37
Wheat bran	0	4	9	13.5
Rice	18.45	16.45	10.45	6.45
Rice polishing	10	6	5	2.5
Soyabean meal	11	11	11	11
Cottonseed meal	4	4	4	4
Corn gluten meal 30% (CP)	4	4	4	4
Corn gluten meal 60% (CP)	6	6	6	6
Fish meal	5	5	5	5
Bergafat	0	2	4	6
Molasses	2	2	2	2
DCP	1	1	1	1
Limestone	1	1	1	1
Vitamin/mineral premix	0.5	0.5	0.5	0.5
L-Lysine	0.03	0.03	0.03	0.03
DL-Methionine	0.02	0.02	0.02	0.02
Composition (%)				
Crude protein	19.79	19.76	19.90	19.95
ME (Kcal/kg)	3072	3087	3086	3088
Crude fiber	4.21	4.11	4.43	4.53
Ca	1.02	1.02	1.02	1.02
Available P	0.48	0.48	0.48	0.48

Table 3: Growth performance and cost per kg live weight gain of broilers fed different levels of bergafat

Items	Diets[1]				SEM
	A	B	C	D	
0-4 weeks					
Feed intake (g/bird)	316[b]	377[b]	488[a]	469[a]	1.06
Weight gain (g/bird)	737[b]	779[ab]	852[a]	837[a]	1.75
FCR	2.33[a]	2.06[b]	1.74[c]	1.78[c]	0.07
Cost of feed (Rs)/kg live weight gain	22.89	21.73	19.05	20.23	---
5-6 weeks					
Feed intake (g/bird)	627[b]	634[b]	759[a]	769[a]	1.26
Weight gain (g/bird)	1383	1458	1301	1361	2.90
FCR	2.21[a]	2.29[a]	1.71[b]	1.77[b]	0.01
Cost of feed (Rs)/kg live weight gain	20.89	23.33	18.04	19.50	---
0-6 weeks					
Feed intake (g/bird)	943[c]	1011[b]	1247[a]	1238[a]	6.09
Weight gain (g/bird)	2121	2237	2154	2198	9.12
FCR	2.25[a]	2.21[a]	1.73[b]	1.78[b]	0.06
Cost of feed (Rs)/kg live weight gain	21.89	22.53	18.54	19.87	---

[1]A, B, C and D stand for 0 (control), 2, 4 and 6% inclusion of bergafat in the diets, respectively; [abc]Means in a row with different superscripts differ significantly ($P < 0.05$).

Table 4: Organ Characteristics of broilers fed different levels of bergafat

Items	Diets[1]				SEM
	A	B	C	D	
Dressing percentage	57.72[b]	62.21[a]	61.09[a]	60.77[a]	0.79
Visceral fat percentage	4.37[a]	3.94[ab]	3.35[b]	3.49[b]	0.09
Relative organ weight (g/100 g)					
Heart	0.65	0.60	0.56	0.60	0.01
Liver	5.42	4.48	4.81	5.20	0.91
Gizzard	2.94	2.74	2.88	2.82	0.07
Pancreas	0.49	0.46	0.40	0.39	0.01

[1]A, B, C and D stand for 0 (control), 2, 4 and 6% inclusion of bergafat in the diets, respectively; [ab]Means in a row with different superscripts differ significantly ($P < 0.05$).

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