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INFLUENCE OF SUPPLEMENTED WHEY ON GROWTH PERFORMANCE AND INTERNAL ORGANS PERCENTAGES OF BROILER CHICKENS

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ABSTRACT*:* An experiment was conducted with hundred and sixty, one day old unsexed broilers to investigate the effects of whey protein on growth performance and internal organs percentage. Four dietary treatments, each consisting of 4 replicates. Diets were control with 0% whey protein (diet A) and whey protein was added at 2, 4 and 6% (B, C and D respectively). Traits studied were feed consumption, weight gain, feed conversion ratio, internal organs percentage and dressing percentage. Results revealed that no differences were found in feed consumption, weight gain and dressing percentage among the four treatments, a lower feed conversion ratio was observed in week 5 with control group. There was no effect of whey protein on internal organs except the intestine, abdominal fat and gizzard percentages were significantly ($P < 0.05$) affected by the treatment. Chicks in treated groups reported high estimates of intestine and gizzard than control group. On the other hand, the lowest estimates of abdominal fat were observed by groups A and C. It concluded that up to 6% of whey protein can be incorporated in broilers ration because it's cheaper source of proteins and economically more profitable than control diet. The dietary whey protein seems acceptable and palatable to the birds.

Keywords: Animal Protein, Broilers, Performance.

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INTRODUCTION

Dairy products have been used as fillers and binders in comminuted meat products to improve texture and sensory properties and minimize cooking losses (Hung and Zayas, 1992). The properties of milk proteins are related to immobilization of water, texture and color improvement and enhancement of sensory properties (Ulu, 2004). Whey protein is widely used in food products because of their high nutritional value and their ability to form gels, emulsions or foams (Lefevre and Subirade, 2003).

Whey proteins provide high levels of essential and branched chain amino acids. However, whey protein isolates are the purest protein source available (Hoffman and Falvo, 2004). During the processing of whey protein isolate there is a significant removal of fat and lactose. As a result individuals who are lactose intolerant can often safely take these products (Geiser, 2003). Dried whey that is produced from its liquid form can be used in chickens (Susmel et al., 1995).

There is extensive research on the using whey protein concentrate in emulsion and emulsion type meat products (Hung and Zayas, 1992; Özdemir et al., 1994; Zt,orba et al., 1994; Hughes et al., 1998; Lyons et al., 1999; Serdaroğlu and Sapancı-Özsümer, 2003; Serdaroğlu and Deniz, 2004). However, there are a few studies on the effect of whey powder and skim milk powder on yield, textural properties and sensory characteristics of patty. Recently, studies highlighted opportunities to use whey proteins as vehicles for bioactive ingredients (Hebrard et al., 2006; Livney, 2010). These ingredients must be consumed orally and should therefore pass through the entire gastro-intestinal tract. Moreover whey proteins have potential as functional food ingredients for persons with obesity (Luhovy et al., 2007). Therefore, the objective of the present study was to determine and to assess the effect of dietary supplementation of whey protein on broiler growth performance and internal organs percentage.

MATERIAL AND METHODS

Experimental birds

One hundred and sixty one-day old unsexed commercial broiler chicks (Hubbard) were purchased from commercial poultry company on arrival chicks were placed in sixteen pens they were fed the control diet ad libitum for 3 days as adaptation period. The chicks were divided into four groups, with four replicates (10 chicks per each).

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Experimental diets

Four experimental diets were formulated from local ingredients with one basal diet. The diets were approximately isocaloric and isonitrogenous with different levels of added whey protein (0, 2, 4 and 6%). The ingredients constituents of experimental diets are shown in Table 1 their calculated compositions are tabulated in Table 2. The experimental diets were formulated and adjusted to meet the nutrient requirement of broiler as outlined by the National Research Council (1994), and subjected to a proximate analysis according to A.O.A.C. (1990).

Table 1 - The ingredients constituents of experimental diets

Ingredients	Whey protein %			
	0	2	4	6
Sorghum	60.2	58.4	58.4	58.4
Groundnut meal	24.2	24	22	20
Sesame meal	5.5	5.5	5.5	5.5
Wheat bran	1.36	1.36	1.36	1.3
Super concentrate	5	5	5	5
Whey protein	0	2	4	6
Di-calcium phosphate	0.74	0.74	0.74	0.74
Limestone	0.24	0.24	0.24	0.24
Salt	0.2	0.2	0.2	0.2
Lysine	0.12	0.12	0.12	0.12
Methionine	0.09	0.09	0.09	0.09
Vegetable oil	2.1	2.1	2.1	2.1
Premix	0.25	0.25	0.25	0.25
Total	100	100	100	100

Table 2 - Calculated compositions of experimental diets

Items	Whey protein %			
	0	2	4	6
ME (kcal/kg feed)	3200	3189	3190	3191
CP	23	23.5	23.3	23.2
CF	4.12	4.06	3.86	3.67
Ca	1.04	1.04	1.03	1.02
P	0.45	0.45	0.45	0.44
Lysine	1.22	1.21	1.18	1.16
Methionine	0.51	0.51	0.5	0.49

Carcass preparation

At the end of the experimental period, the birds were starved overnight from feed, whereas waster was available. Eight birds from each treatment (2birds/replicate) were selected randomly then they were leg-tagged then individually weighed and slaughtered. Hot and cold carcass weights were recorded, Carcasses weight was recorded and the dressing percentage was determined by expressing carcass weight to the live weight.

Experimental design and statistical analysis

The experimental design of the trail was a completely randomized design (CRD). The data obtained were tabulated and subjected to analysis of variance (ANOVA) according to Gomez et al. (1984). The significant difference test was used for treatments mean separation.

RESULTS AND DISCUSSION

The results of feeding graded levels of whey protein (0, 2, 4, and 6%) on the performance of broiler chicks are presented in Table 3. The results showed that there were no significant differences ($P > 0.05$) in the total feed intake (g), but it tended to be higher for birds fed the treated diet. The total weight gain (g) and feed conversion ratio (g feed/g gain) were not significantly ($P > 0.05$) affected by the inclusion of whey protein, but the best results of body weight gain and feed conversion ratio were obtained by birds fed the diet contained 6% whey protein

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followed by those fed the other tested diets. Weekly feed intake was not significantly (P > 0.05) different a:mong dietary treatments as shown in Table 4, feed intake tended to be higher for birds fed different levels of whey protein. This increase in the intake might be related to palatability and higher digestibility of whey protein based diets. In addition, the acceptable essential amino acids profile of whey protein which reported by Hoffman and Falvo (2004). The effects of dietary treatments on weekly body weight gain and weekly feed conversion ratio (FCR) are shown in Tables 5 and 6. Results revealed that treatment had significant (P < 0.05) affect on weekly weight gain and feed conversion ratio. Body weight gain was shown to be higher in the first and fifth weeks of age for chickens fed treated diets by increased level of whey protein, despite their similar compared with the birds in the control group. Gulsen et al. (2002); Kermanshahi and Rostami (2006) found that body weight gain to be greater for chickens offered dried whey protein in amounts equivalent to a whey protein level between 3–6 g/kg–1. Broiler chicks offered whey protein had better feed conversion ratio than control. These effects somewhat resemble those reported by Awano (2004) who found that the dietary presence of whey protein counteract the decrease of feed efficiency in broilers when fed diets burdened with added oxidized soybean oil. The findings of the present study on internal organs percentages (intestine, Abdominal fat, Liver, Heart, Spleen, Gizzard) and dressing percentage (Table 7) indicated that intestine, abdominal fat and gizzard percentages were significantly (P < 0.05) influenced by the treatments. Birds fed control diet obtained lower percentage on these parameters than treated groups. Proteins from animal sources (i.e. eggs, milk, and meat) provide the highest quality rating of food sources. This is primarily due to the 'completeness' of proteins from these sources. Although protein from these sources are also associated with high intakes of saturated fats, there have been a number of studies that have demonstrated positive benefits of animal proteins in various population groups (Campbell et al., 1999; Pannemans et al., 1998). However, there were no significant (P > 0.05) influenced for liver, heart, spleen and dressing percentages by the dietary treatments. Feeding economics of experimental diets are presented in Table 8. The result showed that diet D (contained 6% whey protein) is cheapest one, it followed by diets C and B than control. Broiler chicks received diet D recorded the highest profitability than other groups.

Table 3 - Overall performance of broiler chicks as affected by dietary inclusion of whey protein

Parameters	Treatments				±SEM
	A	B	C	D	
Total feed intake (g/bird)	3189.5	3221.0	3197.4	3221.0	55.68
Total body weight gain (g/bird)	1791.5	1751.8	1809.4	1962.5	71.03
Feed conversion ratio (g feed/g bird)	1.84	1.79	1.77	1.63	0.07

Table 4 - Weekly feed intake of broiler chicks as affected by dietary inclusion of whey protein (g/bird)

Weeks	Treatments				±SEM
	A	B	C	D	
1	137.17^{b}	213.17^{ab}	225.67^{a}	219.33^{ab}	10.35
2	341.07	357.57	379.00	380.67	16.19
3	396.23^{b}	438.33^{ab}	492.33^{a}	495.33^{a}	20.79
4	599.34	606.47	611.00	612.07	18.14
5	767.29^{a}	777.70^{a}	700.00^{b}	718.57^{ab}	18.84
6	898.38^{a}	827.77^{ab}	789.37^{b}	770.93^{b}	24.69

Table 5 - Weekly body weight gain of broiler chicks as affected by dietary inclusion of whey protein (g/bird)

Weeks	Treatments				±SEM
	A	B	C	D	
1	81.67^{b}	82.50^{b}	112.00^{a}	120.23^{a}	6.31
2	199.17	196.23	217.17	193.33	12.94
3	203.07	211.83	227.83	208.33	11.59
4	252.75	268.75	256.67	311.83	27.93
5	415.83^{b}	365.20^{b}	344.50^{b}	590.04^{a}	33.76
6	635.80	627.25	633.37	559.87	47.47

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Table 6 - Weekly feed conversion ratio of broiler chicks as affected by dietary inclusion of whey protein (g feed/g bird)

Weeks	Treatments				±SEM
	A	B	C	D	
1	2.30^{ab}	2.59^{a}	2.03^{bc}	1.84^{c}	0.12
2	1.73^{b}	1.82^{ab}	1.75^{b}	1.97^{a}	0.07
3	1.97^{b}	2.08^{ab}	2.16^{ab}	2.39^{a}	0.11
4	2.37	2.30	2.40	2.06	0.20
5	1.33^{c}	2.13^{a}	2.04^{a}	1.73^{b}	0.09
6	1.42	1.33	1.29	1.39	0.12

Table 7 - Internal organs percentage of broiler chicks as affected by dietary inclusion of whey protein (%)

Parameters	Treatments				±SEM
	A	B	C	D	
Intestine	5.18^{c}	7.74^{a}	6.96^{ab}	6.72^{b}	0.28
Abdominal fat	1.05^{c}	1.46^{b}	1.07^{c}	1.85^{a}	0.11
Liver	2.45	2.11	2.70	2.68	0.13
Heart	0.55	0.57	0.61	0.50	0.04
Spleen	0.24	0.23	0.27	0.28	0.03
Gizzard	2.37^{b}	2.96^{a}	2.92^{a}	2.86^{a}	0.15
Dressing	66.06^{a}	61.64^{b}	61.85^{b}	64.04^{ab}	0.93

Table 8 - The feeding economics of experimental diets

Items	Experimental diets			
	A	B	C	D
Sudanese Pounds				
Feed cost per bird (SP)	15.940	15.899	15.397	15.126
Total cost per bird (SP)	18.940	18.899	18.397	18.126
Average weight of bird (kg)	1.257	1.187	1.274	1.307
Total returns (SP)	28.911	27.301	29.302	30.060
Net profit per bird (SP)	9.871	8.402	10.905	11.934
Dollar				
Feed cost per bird ($)	1.771	1.767	1.711	1.681
Total cost per bird ($)	2.104	2.100	2.044	2.014
Total returns ($)	3.212	3.033	3.256	3.340
Net profit per bird ($)	1.108	0.934	1.212	1.326

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