Egypt. J. Agric. Res. , 71 (3), 1993.

UTIZATION OF POULTRY FEATHERS IN FOOD AND FEED:
2. NUTRITIONAL AND ECONOMIC ASPECTS OF CHICKEN HYDROLYZED FEATHER MEAL AS TESTED ON STARTING CHICKENS

MOHAMED KH. IBRAHIM,[1] NABILA Y. EL-SANAFIRY[2] AND ADEL A. ABD EL-MOATY[1]

1. Dept. of Animal production, Faculty of Agric., Moshtohor, Zagazig University.

2 . Food Technology Resaerch Institute, Agricultural Research Cnetre, Giza, Egypt.

(Manuscript received 22 May 1990).

Abstract

Hydrolyzed feather meal (HFM) prepared from chicken feathers by NaOH hydrolysis was evaluated on starting chickens for nutritional, bilogical and economic aspects.A number of 150 Habbard chicks, 1 day of age, were fed for 7 days on a commercial ration, then (at 8 days of age) were randomly dsitributed on 3 groups and each group was divided into 5 subgroups (5 replicates, 10 chicks in each). Feeding lasted for 7 weeks. In starter and finisher diets HFM protein replaced 0.25 and 50% of the ration protein. At 8 weeks of age body weight was 1767, 1749 and 1561 respectively for 3 groups, while daily weight gain was 44.00 , 43.74 and 39.54gm for chickens of control. 25% HFM and 50% HFM ration respectively . Differences between control and 25% HFM groups were insiginficant , but were significant between the control and 50% HFM groups. No mortality cases occured during feeding experiment. With regard to breast bone length, shank length, feed consumption and feed conversion, differences between control and 25% HFM (in contrast to 50% HFM as compared to control) were insignificant. Digestion coefficient of C.P. was highest for 25% HFM, but this was not reflected in better gain results as compared to control group, becaouse of less E.E., C.F. NFE and O.M. digestion coefficients. All digestion coefficients were lowest for 50% HFM groups. Calculated selling price of 1 ton HFM was 2.71 % adn 5.89 of that of fish meal and soy meal respectively. Economic efficency for 25% HFM was higher than for the control ration. AT 25% level, HFM protein could replace completely the fish meal (animal protein) and partially the soy meal indicating the high nutritional biological value at mentioned level. It is suggested to use such meal for poultries rations and investigate the possibility of its use in man's diet.

INTRODUCTION

Undoubtedly keratin raw material contain much protein and essential amino acids (EAA), and might aid to some extent in solving the problem of animal feeds and/or using in mans diet. Nevertheless, nutritional and biological values of any protein source control its utilization regardless of the high protein content . In this concern, conflicting data call for extensive further studies for evaluation of feather protein. Ruth (1942) studied the nutritional value of powdered chicken feathers(as sole source of protein) and reported that the protein supported moderate growth in young rats when it was supplemented with tryptophan, methionine , lysine and histidine. Draper (1944) found that the treated feather meal when addedto an all cereal basal diet significantly increased chick growth. On the contrary, Naber et al. (1961) found that feather meal as the primary source of protein for the chick was never as good as comparable corn-soybean meal diets,regardless of amino acid supplementation . Moran et al . (1966) found that hydrolyzed feather meal (HFM) could replace 25% of protein in a practical corn - soybean ration when tested on chick. This was previously found by Naber et al.(1961) But Wiseman et al. (1958) recommended to replace only 16.67% (about one -sixth) of the crude protein ration by HFM protein, when the latere was tested on growing broiler. Substitution of ration protin with HFM protein at 50% depressed the growth due to EAA defficiency (Naber etal 1961). According to Moran *et al* . (1966) deficient EAA are methione lysine and typtophan; being methionine and lysine only as mentioned by Bhargava and O'Neil (1975). With methionine and lysine supplementation of up to 40% of the dietary crude protein (24%) could be supplied by HFM with little depression in chick growth rate and efficiency of weight gain as reported by Baker *et al.* (1981).

Lillie et al . (1956), Naberand Morgan (1956), Wiseman et al . (1958) and mckerns and Rittersporn (1958) reported that, when investigating growth responces by chicks HFM seems to contain an unidentified growth factor. On the other hand, Naber et al . (1961) reported that failures sometimes, to obtain maximum growth with EAA supplementation indicated that HFM might contain what was called "toxic principles". Sibbald et al . (1962) explained the successful partial substitution of ration protein with HFM protein, in contrast to complete substitution, by that the prime value of HFM protein may be as a source of "non - specific" nitrogen. Therefore, it is critical to carry out more biological sutdies on experimental animals.

Thsi work was conducted to evaluate the nutritional value of chickens HFM on starting chickens, when used to subtitue 25 and 50% of ration protein, provided that

the latter is supplemented with methionine and lysine.

MATERIALS AND METHODS

The present study was carried out on a private chicken production farm at El-Quanater El-Khayrya (Egypt), 4 battery brooders were designated for this investigation. The study started at October 1987 and lasted for 8 weeks . A number of 150 Habbard chicks, 1 day of age, were fed 7 days on a commerical ration . Chicks (8 days in age) were then divided randomly into 3 groups and each group into 5 subgroups (5replicates, 10 chicks in each) . Feeding lasted for 7 weeks. the three groups of chicks were fed on a control ration (O% HFM), and on same ration wher HFM replaced 25 or 50% of the control ration protein. All the feeding treatments were isoenergetic and isonitrogenous. The composition of used ration are given in Table 1. Fresh water and diets were offered to chicks according to the National Research Council (1984). Chicks received veterinay care with respect to all needed vaccines given at suitable ages.

Hydrolyzed feather meal (HFM) was prepared by soaking feathers in 4% NaOH soulution for 2-4 days at toom temperature, followed by heating (in same solution) in a water both at 100oC for 6-8 hours for alkaline hydrolysis. After cooling, hydrolyzed solution was neutralized by 15% HCL soulution to pH 7.0, followed by vacuum (500mm) drying at 100^{o}C to obtain HFM according to Gayevoy et al. (1974).

Measurements during feeding experiments included the body weight,weight gain, shank length, keel bone (or breast bone) length , feed consumption, feed conversion and mortality rate, Daily feed consumption per chick was calculated at 7 days intervals for each group and subgroup as follows:

$$\text{Feed consumption} = \frac{\text{Feed consumed/one week/subgroup}}{\text{Number of feeding chicks}}$$

Feed conversion was determined as the consumed feed per gain unit.

During feeding period, two digestibility trials were carried out, the first at the 3rd week, while the 2md at the 6th week of feeding, so as to determine digestibility coefficient. Chemicals analysis of feed smaple and birds manure (collected during digetibility trial period) were carried out (for dry matter , crude protein, crude fat, crude fiber and soluble carbohyfrates using the methods described by the A.O.A.C. (1980) Statistical analysisi were conducted for data in accordance with the

Table 1. Feeding rations composition (%).

Diets ingredients * (%)	Starter diets (2-4) week			Finisher diets (5-8) week		
	Control	25 % HFM	50 % HFM	Control	25 % HFM	50 % HFM
Feather meal	0.00	8.14	16.27	0.00	6.91	13.82
Yellow corn	67.52	68.23	71.18	74.44	75.26	77.60
Soybean meal	26.00	19.70	8.08	20.00	13.70	4.00
Fish meal	3.20	0.00	0.00	2.00	0.00	0.00
Bone meal	2.80	3.18	3.36	3.10	3.40	0.25
NaCL	0.25	0.25	0.25	0.25	0.25	0.15
Premix	0.15	0.15	0.15	0.15	0.15	
Supplemention						
L-Lyslne	0.00	0.22	0.53	0.00	0.21	0.47
DL- Methionne	0.08	0.13	0.18	0.06	0.12	0.17
Total	100	100	100	100	100	100
Chemical analysis :						
Moisture	10.12	9.68	9.74	10.09	9.83	9.92
Crude protein	21.20	21.23	21.18	18.07	18.17	18.19
Ether extract	3.15	2.85	2.90	3.23	3.05	3.09
Crude fibre	2.52	2.27	1.88	2.43	2.19	1.87
Ash	5.90	6.39	6.47	5.68	6.00	6.12
Nirogen free extract	57.10	57.58	57.83	60.50	60.76	60.81
Calculated value						
ME Kcal / Kg	3028.92	2993.15	3002.27	3079.33	3055.63	3061.94
C / P	143	141	142	170	168	168

* Accoding to N.R.C. 1984

procedures described by Steel and Torrie (1980) . Significant diferences between the treatment were determind using Duncan's multiple range test (1955). To throw light upon the economic efficiency, the prices, (of ration and HFM) were calculated according to local market at the time of experiment. At the same time price of 1 kg live weight of chicken was 280 piasters in the local market. The economic efficiency was calculated according to Bayoumi (1980) using the following formula:

Economic efficiency = The revenue/price of consumed feed.

RESULTS AND DISCUSION

1. Body weight and daily gain

a-Body weight

It could be observed from Table 2 that for control ration and 25% HFM ration (HFM replaced 25% of the control ration protein) no significant difference in weight was obseved at any given time of the experiment , indicating similar nutritional values of protein in both rations, possibly beacuse of completing the level of methionine and lysine in 25% HFM treatment to the level calculed for control ration. Therefore, supplementation with a third EAA "tryptophan" as reported by Moran et al. (1966) was unnecessary. Without EAAsupplementation HFM could replace satisfactory not more than 16.67% of ration protein (Wiseman et al . 1958). Results in Table 2 show that supplementation was needed for 25% protein replacement , because the weight in the 25% HFM was slightly less (1749 compared to 1767 g at 8th week) than for control ration, although differeces wre insiginficant. When HFM replaced 50% of protein in ration (50% HFM) significant decrease in body weight (to 1561 gm at 8th week) occured.This might be due to racemization and crosslinking of EAA (Hayashi and Kameda 1980 and Whitaker 1980) or because what so called "toxic principles" (Naber et al. 1961) were affecting at higher (50% HFM) but not at lower (25% HFM) levles of protein replacement.

b- Daily body gian

From results in Table 3, a decrease in daily gain can be observed at 4-5 weeks, probably due to changing from starter diet, which was higher in protein content (21.18 -21.23%) to finisher diet (18.07 - 18.19%, Table 1).

Table 2. Mean* of body weight of starting chickens up to the age of 8 weeks, fed rations containg different percentages of HFM as a source of protein:

Rations	number of chicks	Mean of body weight. g							
		1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
		$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$
Containing:									
0 % treated feather (control)	50	119.4+1.19[a]	252.2±3.01[a]	468.9±4.96[a]	712.6±10.68[a]	923.6±3.98[a]	1166.7±17..86[a]	1461.2±20.72[a]	1767.2±25.32
25 % treated feather	50	119.1+1.19[a]	246.3±3.17[a]	462.7±3.17[a]	702.7±10.55[a]	913.5±12..88[a]	1149.7±13.27[a]	1442.6±17.42[a]	1749.2±15.37[a]
50 % treated feather	50	119.2+1.19[a]	229.8±2.37[b]	410.8±5.24[b]	618.4±8.19[b]	804.8±10.28[b]	1029.0±12.43[b]	1285.0±13.95[b]	1561.8±12.73[b]

* Mean within the same classification followed by the same letters did not differ significanlty ($P < 0.01$) otherwise they do. Simialr tables follow the same notation.

Table 3. Mean of daily gain of starting chickens up to the age of 8 weeks, fed rations containg different percentages of HFM as a source of protein:

Rations	number of chicks	Mean of body weight in (grams)						
		1-2 week	2-3 week	3-4 week	4-5 week	5-6 week	6-7 week	7-8 week
		$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$
Containing:								
0 % treated feather (control)	5	18.97 ± 0.08^{a}	30.96 ± 0.08^{a}	34.82 ± 0.62^{a}	30.14 ± 0.42^{a}	34.73 ± 0.38^{a}	42.07 ± 0.16^{a}	44.00 ± 0.27^{a}
25 % treated feather	5	18.17 ± 0.14^{a}	$30.92 \pm .022^{a}$	34.29 ± 0.61^{a}	30.12 ± 0.38^{a}	33.74 ± 0.37^{a}	41.84 ± 0.85^{a}	43.24 ± 0.64^{a}
50 % treated feather	5	15.80 ± 0.16^{c}	2586 ± 0.71^{b}	29.66 ± 0.67^{b}	26.63 ± 0.42^{b}	32.03 ± 0.38^{b}	36.57 ± 0.34^{b}	$39..54 \pm 0.34^{b}$

Finisher diet was also somewhat lower in ash (minerals) . At any given time of the experiment, no differences were found between the daily gain of control and the 25% HFM ration (except between 1 and 2 weeks), this was statistically proven. Nevertheless, at 50% HFM level, significant differences between treatments were found. At 8 weeks of age daily weight gain were 44.00, 43.74 and 39.54 g for chickens of control, 25% HFM and 50% HFM rations, respectively. Such results are confirmed by data of Table 4. where relative effects of different rations on the body weight and daily gain at 7-8 week of age were calculated.

2. Breast bone and shank lengths

Data given in Tables 5 and 6 show that breast bone (keel bone) and shank lengths changes and followed the trends of body weight and daily gain (Tables 2 and 3). Thus, for control and HFM rations differences with respect to both breast bone and shank lengths were insignificant, while 50% HFM protein ration showed significant decrease in both lengths at 8 weeks of age.

3 . Mortality rate

During the first week , i.e. the period proceding the feeding experiment, all chicks (150 chicks0 received the same control ration free of HFM, a number of 4 chick dead, showing a mortality percentage of 2.67% . from the beginning of 2nd week and till the 8th week, i.e. during the experiment period at which feeding trial was carried out on rations, where HFM protein replaced 0%, 25% of the control ration no mrtality cases occurred.

4 . Feed consumption and feed conversion

From the reults in Table 7, it can be observed that when compared with the control ration, 25% HFM ration (in contrast to 50% HFm ration) revealed no significant difference with regared to feed consumption and feed conversion.Therefore, replancement of 25% of the control ration protein with equal proportion of HFM protein is quite practicable and useful.

5 . Digestion coefficients:

Data in Tables 8 and 9 show that substitution of 25% and 50% of the control ration protein with equal proportion of HFM prtotein resied the digestion of C. P. from 79.45 % to 81.69 and 80.14% (starter diet) respectively. However, such increase was not reflected on the live body weight and daily gain (Table 2 and 3) ,

Table 4. Relative effects of different rations on the body weight and daily gain at f7-8 weeks, of age:

Rations	Mean, g		Control and25% HFM ration when cmopared with 50% HFM ration		Control ration when cmopared with 25% 50% HFM ration	
	Body weight	Daily gain	Body weight	Daily gain	Body weight	Daily gain
Containing:						
0 % treated feather (control)	1767.2	44.00	113.15	111.28	100	100
0 % treated feather	1749.2	43.74	112.00	110.62	98.98	99.40
0 % treated feather	156.1	39.54	100	100	88.38	89.86

Table 5. Means of brast bone length (keel bone) of starting chicken up to the age of 8 weeks fed,rations containing different percentage of HFM as a source of protein.

Rations	number of chicks	Breast bone length, Cm.							
		1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
		$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$
Containing:									
0 % treated feather (control)	50	4.28 ± 0.02^a	5.76 ± 0.05^a	$7.03 + 0.06^a$	$8.10 + 0.06^a$	$8.85 + 0.06^a$	$10.08 + 0.09^a$	$11.05 + 0.09^a$	$12.64 + 0.07^a$
25 % treated feather	50	1.27 ± 0.02^a	5.79 ± 0.05^a	$7.07 + 0.07^a$	$8.15 + 0.08^a$	$8.88 + 0.08^a$	$10.11 + 0.22^a$	$11.09 + 0.10^a$	$12.67 + 0.08^a$
50 % treated feather	50	4.28 ± 0.02^a	4.94 ± 0.03^b	$5.96 + 0.04^b$	$6.99 + 0.05^b$	$7.87 + 0.^a$	$8.90 + 0.05^b$	$9.84 + 0.06^b$	$10.93 + 0.05^b$

Table 6. Means of shank length of starting chickens up to the age of 8 weeks, fed rations containing differen tpercertages of HFM as a source of protein

Rations	number of chicks	Shank length (in Cm)							
		1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
		$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$	$\bar{x} \pm SE$
Containing:									
0 % treated feather (control)	50	2.27+0.02	3.17+0.03	3.93+0.04	4.77+0.05	5.48+0.05	6.35 +0.05	7.15+0.05	7.88+0.05
25 % treated feather	50	2.26+0.02	3.14 +0.03	3.90+0.04	4.75+0.04	5.46+0.05	6.30+0.05	7.11+0.05	7.86+0.05
50 % treated feather	50	2.26+ 0.02	2.90+0.03	3.50+0.04	4.10+0.05	4.78+0.05	5.51+0.0	6.24+0.06	6.93+0.07

Table 7. Mean daily fed consumption and feed conversion of chicken from 2nd to 8th week of age, fed three different rations (in gram).

Triats	%of HFM protein included in the ration at																				
	2nd Week			3nd Week			4th Week			5th Week			6th Week			7th Week			8th Week		
	0%	25%	50%	0%	25%	50%	0%	25%	50%	0%	25%	50%	0%	25%	50%	0%	25%	50%	0%	25 %	50 %
Feed comsumption	a 27.84	a 27.68	a 27.73	a 46.88	a 47.79	a 49	a 61.47	a 62.18	b 65.20	a 71.73	ab 73.47	b 75.03	a 91.36	ab 91.71	b+ 94.03	a 115.92	ab 118.08	b+ 119.8	a 127.7	ab 129.3	b 133.7
Feed conversion	a 1.47	a 1.52	b 1.75	a 1.51	a 1.55	b 1.92	a 1.77	a 1.81	b 2.18	a 2.38	a 2.44	b 2.82	a 2.63	a 2.72	b 2.94	a 2.76	a 2.82	b 3.27	a 2.90	a 2.95	b 3.38

Diferences between means having th same suprscripts in the same raw are non significant .
+ $p < 0.05$
Means square of ANOVA significant at 1 % level
Means square of ANOVA significant at 5 % level

Table 8. Average of digestion coefficients for starter diets conating 0 % , 25% and 50% HFM.

Treatments	Digestion coefficients %				
	C.P.	E.E.	C.F.	N.F.E.	O.M.
0% treated feather control	79.45	74.02	18.46	80.11	77.29
25 % treated feather	81.69	71.18	16.75	77.67	74.62
50% treated feather	80.14	68.81	15.10	74.86	71.70

Table 9. Average of digestion coefficients for finisher diets containing 0%, 25 % and 50% HFM

Treatments	Digestion coefficients %				
	C.P.	E.E.	C.F.	N.F.E.	O.M.
0% treated feather control	81.75	77.83	21.77	84.32	81.29
25 % treated feather	93.04	73.90	18.97	82.45	79.73
50% treated feather	81.87	69.96	17.63	79.25	74.93

probably due to tless digestion coefficients of E. E., C. F., N. F. E. and O. M. from HFM ration . Diests with 50% HFM showed lower values for all studied digestion coefficents than that prepared with 25% HFM. This was found for starter and finisher diets. But as it is generally known, with advance in age to a certain limit, the digestion coefficient of C.F. for finisher diet than the starter ration, might be attributed to that fibers are usually digested at extremely low level for chicks or unabsorbed at all; while for bigger chickens digestion of crude fibers somewhat increased. Finally, it is clear that C.P. digestion coefficients were relatively high in case of 25 HFM treatment.

6 . Production cost and selling price of HFM :

Cost of 1 ton HFM was calculated as follows:

	Egyptian pounds
Price of 1 ton untreated feather	30
Coast of 1 ton untreated feather for production of 1 ton HFM (yield "115.21%"	26
Packing cost 10	
Total cost of packaged HFM (1ton)	36
Okys 10% Processing cost 39.6	
Pluse 10% administration and financial costs	43.26
(production cost)	
Plus 15% benefit (selling price)	50.10

Selling price of 1 ton HFM to be used as protein source, is markedly less (50.10 L.E.) Than many other sources of protein such as the fish meal (1850 L.E.) and defatted soy meal (850 L.E.) HFM in present experiment substituted the proportion of fish meal in ration completely, and soy meal partially (Table 1).

7 . Economic efficiency

The economic efficiency of complete replacement of the fish meal and partial

replacement of soy meal used in common (control) ration , starting and finishing rations (Table1) with HFM during raising starting chidckens is shown in Table 10. It is evident that highest economic efficiency (2.08 L. E.)was found for 25% HFM ration, followed by 50% HFM ration, being lowest for the control treatment (1.76 L.E.). Therefore while undobtedly, 25% HFM was the best treatment, it seems that 50% HFM ration was better than the control one, But this reflects the velocity of investments circulation only. In fact the actual revenue per bird (Table 10) for control treatment was higher by 24.15 piasters per bird in the case of 50% HFM treat-

Table 10. Effect of protein replacement of fish meal completely, and soybean meal partially with equal proportions of HFM protein in starting and finishg rations on the economics of broiler production:

Item	Treatments		
	0.00% HFM	25 % HFM	50% HFM
Average feed consumed (kg/bird)	3.800	3.851	3.955
(1)	47.24	41.34	39.98
Price/kg feed (P.T)	179.51	159.20	146.26
Total feed cost (P.T.)	1.767	1.749	1.562
Average live weight (kg /bird)			
(2)	280	280	280
Price /kg live weight (P.T)	497.76	489.72	437.36
Total revenu (P.T.)	315.25	330.52	291.1
Net revenue per bird (P.T.)	1.76	2.08	1.99
(3)			
Economic efficiency (E.E.f)	24.15	39.42	0
Increase in revenue per bird (as compard with 50/HFM ration)			
Relative economic efficeincy per bird % (as compared with 50/HFM ration)	8.30	13.54	0

(1) According to the price of different ingredients available in A.R. Egypt at the experimtal preiod.
(2) According to the local market price at the experimental period.
(3) Net revenue per unit cost.

ment and by 15.27 piasters as compared with control. Therefore bth economic efficency and net revenue per bird were hightst for 25% HFM ration.

Finally the results obtained indicate that concerning the nutritional and bilogical value of HFM protein as tested on starting chickens, best results were obtained when this protein replaced 25% of the diet protein . At this level HFM could replace completely the high priced fish meal and partially the soy meal . Becaouse of unrejected colour (light yellow) this meal might be incorpoarted in meat burgers. the glue flavour was not intense and might be masked by the added spices.Experiments to fulfill this task is now being carried out .

REFERENCES

1 . A.O.A.C. 1980. Official Methods of Analysis, Association of Offical Analytical Chemists, Washington, D.C.

2 . Baker, D.H., R.C: Blitenhal, K.P. Bobel, C.L., Czarnecki, L.L. Southern and G.M. Wills. 1981. Protein amino acid evaluation of steam-processed feather meal, Poultry Sci.,60 : 1865-1872.

3 . Bayoumi, S.B. 1980. Effect of different ration on egg production for breeding hens, M.Sc. Thesis, Fac. Agric. Kafr El-Sheikh, Tanta Univ.

4 . Bhargava, K.K. and B.O'Neil. 1975 Composition and utilization of poultry by - product and hydrolyzed feather meal in broiler diets, Poultry Sci., 54:1511-1518.

5 . Draper, C. I. 1944. The nutritive value of corn oil meal and feather protein, Iowa Agric. Expt. Station, Res. Bull. No. 326.

6 . Duncan, D. S. 1955. Multiple range and multiple F tests. Biometrics, 11:1-42.

7 . Gayeveoy, E., A. Snitsor, E. Stinchkum, I. Moshkuttello and I. Ptaka, 1974. Biological value of Keratin meal manufactured in accordance with a new production process, Meat Industry, Ussr, 45 (5) :38-39.

8 . Hayashi, R. and I. Kameda, 1980. Racemization of amino acid residues during alkali - treatment of protein and as adverse effect on pepsin digestibilty , Agric. Biol. Chem., 44:891-895.

9 . Lillie, R.J., J.R. Sizemore and C. A. Denton. 1956. Feather meal in chick nutrition, Poultry Sci., 35:317-318.

10 . Mckerns, K.W. and E. Rittersporn, 1958. The nutritional significance of pro-

cessed keratin in poultry feeding, poultry Sci., 37:433 - 436.

11 . Moran , E. T., Jr. J.D. Summers and S. I. Slinger. 1966. Keratin as a source of protein for the growing chick: 1. Amino acid inbalance as the cause for inferior performance of feather meal and the implication of disulfide bonding in raw feathers as the reason for poor digestibility, Poultry Sci., 45:1257 -1966.

12 . Naber, E.C. and C.L. Morgan. 1956. Feather meal and poultry meat scrap in chick starting rations, Poultry Sci., 35:888-895.

13. Naber. E. C., S.P. Touchbrun, B.D. Barnett and C.I. Moran, 1961. Effect of processing methods and amino acids supplementation on dietary utilization of feather meal protein by chicks, Poultry Sci., 40:1234 - 1244.

14 . National Research Council. 1984. Nutrient Requiremdnts of poultry, 8the rev. Ed., Nat. Acad. Press, Washington, D.C.

15 . Ruth , J.L. 1942. Nutritional studies on powdered chicken feather, J. Nutrition, 24:399-404.

16 . Sibbald, I.R., S. J. Slinger and W.F. Pepper. 1962. The utilization of hydrolyzed feather meal by growing chicks, Poultry Sci., 41:844-849.

17 . Steel, R.G.D. and J.H. Torrie. 1980. Principles and procedures statistics, 2 nd Edit. McGraw Hill Book Co. Inc., New York.

18 . Whitaker, J.F. 1980 . Change occurring in proteins in alkaline solution, in Chemical Deterioration of proteins Ed. J.R. Whitaker and M. Fujimaki, P. 145-163.

19 . Wiseman, E.L., C.E. Holmes and R.W. Engel. 1958. Utilization of poultry by - products in poultry ration, poultry Sci., 37:834 - 838.

الأستفادة من ريش الدواجن في الطعام وفي العلائق :٢-القيمة الغذائية والنواحي الأقتصادية لمسحوق ريش الدجاج المحلل (ر.د.م.) عند اختباره علي الكتاكيت البادئة

محمد خيري ابراهيم[١] نبيلة يوسف الصنافيري[٢]
عادل عبد المعطي عبد المعطي[٢]

١- قسم الإنتاج الحيواني ، كلية الزراعة ، مشتهر، جامعة الزقازيق
٢ - معهد بحوث تكنولوجيا الأغذية - مركز البحوث الزراعية ، مصر.

مسحوق الريش المحل المجهز من ريش الدجاج بالتحليل بالصودا الكاوية ثم تقييمه علي الكتاكيت البادئة من حيث القيمة الغذائية والبيولوجية والنواحي الاقتصادية . وقد استخدم في هذه الدرساة ١٥٠ كتكوتا (من نوع هبرد ×) بعمر يوم وادح وغذيت لمدة ٧ أيام علي عليقه تجارية ثم (علي عمر ٨ يوم) وزغت عشوائيا علي ٣ مجموعات وكل مجموعات قسمت الي ٥ تحت مجاميع (٥ مكررات، ١٠ كتاكيت فيكل مكرر. وأستمرت التغذية لمدة ٧أسابيع . وفي العليقه البادئه والنهاهية تم استخدام ربش دجاج محلل بحث يحل بروتينه محل نسبه صفر (كنترول) ، ٢٥٪ ، ٥٠٪ من بروتين المقارنه (الكنترول) وفي نهايه ٨ أسابيع من العمر وجد أن وزن الجسم ١٧٦٧، ١٧٤٩، ١٥٦١ جراما علي التوالي في حين أن الوزن مكتب يوميا كان ٤٤,٠٠ ، ٤٣,٧٤، ٣٩,٥٤ جراما لمجموعه الكنترول ومجموعه ٢٥٪ ، ٥٠٪ ريش دجاج محلل ولم تحدث حالات موت خلال فتره غير معنويه بالنسبه لمجموعه الكنترول، ٢٥٪ ريش دجاج محلل ولم تحدث حالات موت خلال فتره تحربهع التغذية. وفيما يختص بطول عظمه القص وطول القدم ، الغذاء المستهلك وكفاءه تحويل الغذاء فقثد كانت الفروق غير معنويه بين مجموعة الكنترول ومجموعه ٢٥٪ ريش دحاج محلل (بعكس مجموعه ٥٠٪ ريش دجاج محلل بالمقارنه بمجموعه الكنترول). وكان معامل هضم البروتين أعلي ما يكون في مجموعه ٢٥٪ ريش دجاج محلل ولكن هذا لم ينعكس علي الزياده المكتسبه في الوزن بالمقارنته بمجموعة الكنترول لانخفاض معاملات هضم الدهن والالياف الخام والمستخلص الخالي من النتروجين والماده العضويه. غير أن جميع معاملات الهضم كانت منخفضه في مجموعه ٥٠٪ ريش دجاج محلل وبحساب ثمن صعر بيع الواحد طن من ريش الدجاج المحلل اتضح انه مخفضه جداً وبشكل ٢,٧١ ، ٥,٨٩ ٪ فقط من ثمن سعر بيع مسحوق السمك وكسب فول الصويا علي التوالي . كانت الكفاءة الاقتصاديه لمجموعة ٢٥٪ ريش دجاج محلل أعلي من مجموعه الكنترول . وعلي مستوي ٢٥٪ بروتين ريش دجاج محلل استطاع مسحوق الريش المحل أن يحل بالكامل محل مسحوق السمك جزئيا محل كسب فو الصويا مما يدل علي القمية الفغذائية والقيمة البيولوجيه العاليه لريش الدجاج المحلل علي المستوي المذكور . ويقترح بالتالي استخدام رويش الدجاج المحلل في علائ الذواجن ودراسه امكانيه استخدامه في غذاء الإنسان .