UTILIZATION OF POULTRIES FEATHERS IN FOOD AND FEED: 4- WEIGHT COMPOSITION, CARCASS TRAITS AND MEAT ANALYSIS OF CHICKENS FED ON DIFFERENT LEVELS OF HYDROLISED FEATHER MEAL.

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Abstract

Chicken feathers, as a slaughter house waste, were processed by NaOH hydrolysis, followed by neutralization with HCl and drying to obtain the hydrolyzed feather meal (HFM) which was used to replace 0% (Treatment1, control ration), 25% (Treatment 2, 25% HFM) or 50% (Treatment 3, 50% HFM) of protein in control ration. A number of 150 Habbard chicks were randomly distributed on 3 groups, to be fed on 3 rations. At 8 weeks of age (the end of feeding experiment) 5 birds of each group were randomly separated and sluaghtered to study the influence of HFM on weight composition, carcass traits and meat composition of broilers. Results were statistically analyzed.

Broilers of ration 2 (25% HFM) showed the highest percent of empty carcass, total edible offals and total edible parts , while showed the lowest total inedible parts when compared with ration 1 (0% HFM) or 3 (50% HFM) . The highest percent of meat (% of live weight or % of empty carcass), the highest meat to bone ratio, the lowest percent of bone and the lowest bone to meat ratio were found with 25% HFM treatment. Broilers obtained with 50% HFM were statistically of less quality when compared with treatments 2 and 1 . Highest protein and lowest fat

were found in broilers meat of treatment 2, which had significantly less energy value than the other two treatments being best for some sensitive subjects of special requirements . Processing of chicken feather as a slaughter house waste to obtain HFM for replacing 25% of protein in starting chicken ration bad showed better results when compared with the control ration with regard to weight composition , carcass traits and meat nutritional value.

INTRODUCTION

Goslynnikov (1973) reported the average weight composition of chickens (%of live weight) as the following: Chilled meat (with bones in ice water to $4^{o}C$ 64.1 (including lungs plus kidneys 0.8%), complete set of giblets 7.1 (including liver plus heart 2.3% , empty stomach 2.4% and neck without skin 2.4%), head without neck 3.8, legs 3.3, feathers 6.0, blood 4.2 , intestines full 7.4 , total crop, glandular stomach, gullet , trachea, spleen, ovarium, gall bladder and cuticle substances 2.0 and loss of weight 2.1. The weight composition , however , depends on feeding and management when kind and age of poultry was similar. This was also reported by Sokolov (1965), who mentioned that percent of bones and meat to bone ratio are affected by the level of feeding.

MATERIALS AND METHODS

The purpose of this work is to study the weight, carcass traits and meat analysis of chickens fed on yellow corn-soybean meal-fish meal ration (control). Two other treatments were investigated where chicks were fed on the above ration , provided that 25% or 50% of control ration protein (ration 2 and ration 3, respectively), were replaced with HFM (hydrolyzed feather meal with NaOH and nutralized with HCL) protein (25% HFM and 50% HFM treatments, respectively). The composition of used ration is given in Table 1. A number of 150 Habbard chicks of 1 day old, were fed for 7 days on a commerical ration. After 1 week of feeding , chicks of 8 days-old were divided randomly into 32 groups and each group was subgrouped into 5 replicates of 10 chicks each. Feeding lasted for 7 weeks. At the end of feeding , 5 birds of each group were randomly withdrawn (one bird of each subgroup or rep-

Table 1. Feeding rations composition (%)

Diets ingredient*	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	3.54
Na CL	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.15	0.15	0.15	0.15	0.15	0.15
Supplemention						
L-Lysine	0.00	0.22	0.53	0.00	0.21	0.47
DL-Methionine	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
Nitrogen 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

* According to N.R.C. 1984

licate); fasted for 16 hours, wieghed and slaughtered to calculate the weight composition. Dressing percentage and shape index were also calculated . The bones were separated of the breasts and thighs and meat were analyzed for moisture, protein (N x 6.25; Kjldahl method), fat (hexane solvent, Soxhlet apparatus) and ash using the methods described by the A.O.A.C. (1980) . To caluculate the energy value, protein and carbohydrates (calculated by difference if present) are multiplied by 4.0 and fat by 9.0.

Analysis of variance was conducted for the data in accordance with procedures described by Steel and Torrie (1980). Significant differences between treatment means were determined using Duncan's multiple range test (1955).

RESULTS AND DISCUSSION

1 - Physical composition and carcass traits:

Data presented in Table (2) show the slaughter results which indicate the physical composition and carcass traits of broiler (Habbard), of 8 weeks old as influenced by feeding on rations containing 0% (ration 1), 25% (ration 2) and 50% (ration 3) HFM protein (of control ration protein). the three treatments referred to as control, 25% and 50% HFM, respectively.

The mean results arrived at stands by the second treatment , where 25% of control ration protein was substiuted with equal proportion of HFM protein for the following :

1 . Ration 2(25% HFM) showed the highest percent of empty carcass, when compared with ration 1 or 3; values were 64.88, 63.90% and 63.47%, respectively.

2 . Lowest percent of inedible offals (lungs, head, shank, intestine and wing tips were recorded for ration 2 (19.73%) as compared with 1(20.57%) and 3 (21.73%) . When blood and feathers were added to the mentioned parts (total inedible offals) , lowest percent was also noticed for broilers of ration 2 than 1 or 3 (29.14%, 30.25% and 30.89%, respectively).

3 . Mean percent of liver , gizzard, heart and total edible offals (liver, gizzard and

Table 2. Mean of physical composition and carcass traits of broilers of 8 weeks old on three rations containing 0%, 25% and 50% HFM as a source of protein (in gram)

Starter diets (2-4) week

Rations Containing	Average live ** weight	Average weight ** after slaughter	(+) Average released* blood weight	Average released blood weight %	(1) Avergae carcass** (full weight without blood and feather	(+) Average weight * of feather	Average of feather %	(2) Average empty** Carcass weight	Average empty carcass weight %	(3) Average weight of inedible offals**	Average weight of inedible offals %	(4) (+) Total of inedible offals**	Total of inedible offals %
	x ± SE	x ± SE	x ± SE		x ± SE	x ± SE		x ± SE		x ± SE		x ± SE	
0% treated feather (control)	1866a ± 29.56	1794a ± 26.69	72 a ± 3.03	3.85	1685a±22.01	109a± 4.77	5.78	1192a± 14.16	63.90	283.6a± 5.03	20.57	564a± 11.82	30.25
25% treated feather	1852a ± 29.15	1785a ± 25.99	67 a ± 2.28	3.61	1678a±21.53	107a±4.60	5.77	1201a ±13.49	64.88	365.8a±3.33	19.73	539a±9.77	29.14
50% treated feather	1555b ± 36.96	1532b ± 34.04	56b ±2.96	3.51	1442b± 29.63	90b ± 4.46	5.65	1007b± 20.89	63.47	344.6b±4.16	21.73	490b ± 11.48	3089

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(+) $P < 0.05$

** Mean Square of ANOVA significant at 1% level

* Mean Square of ANOVA significant at 5% level

All percentages related to live weight:

(1) Unempty (full) Carcass.

(2) Empty carcass without liver, heart and gizzard.

(3) Lungs, shank, intestines, head and wing tips (ends).

(4) Lungs, shank, intestines, head wing tips, feathers and blood.

Table 2. Cont.

Diets ingredient*	Average liver weight	Average liver weight %	Average gizzard weight	Average gizzard weight %	Average heart weight	Average heart weight %	(5) Total of edible ** offals x ± SE	Total of edible offals %	(6) Total of edible offals	(+) ** Total edible parts % of live weight (carcass percent or derssing percent) x ± SE	weight loss	weight loss %	** Meat weight x ± SE	** boneless carcass precent x ± SE	** Average one weight x ± SE	Average bone weight %	(7) Meat as % of empty carcass	(8) Meat to bone ratioi	(9) bone to Meat ratio
0% treated feather (control)	38.8	2.07	55.8	2.99	12.4	0.66	107a ± 3.89	5.73	1299	69.63a ± 0.11	2.4	0.13	969a ± 11.84	51.94a ± 0.13	223a ± 4.14	11.96	81.29	4.35	0.23
25% treated feather	40.6	2.19	2.91	2.91	14.2	0.76	108.8 a± 5.66	5.95	1310	70.74b ± 0.11	2.2	0.12	982a ± 11.35	53.04ab±0.16	219.2a ± 2.42	11.84	81.75	4.48	0.22
50% treated feather	32.2	2.02	2.89	2.89	9.6	0.60	87.8b ± 4.42	5.51	1095.4	68.98a ± 0.03	2.0	0.13	816b ± 15.93	51.41a ± 0.14	1916 b± 5.72	12.06	80.99	4.26	0.24

(5) Liver, gizzard and heart (giblets)

(6) Carcass (meat + bones) , liver, gizzard and heart

(7) $\frac{\text{Meat}}{\text{Empty carcass}}$ x 100

(8) $\frac{\text{Meat}}{\text{Bone}}$

(9) $\frac{\text{Bone}}{\text{Meat}}$

heart) was the highest for ration 2 (2.19% , 2.19 % , 0.76% and 5.95% 0.66% and 5.73%, respectively) or ration 3 (2.02% , 2.89% 0.60 and 5.51, respectively). The only exception was recorded for average gizzard weight (%) for ration 2.

4 . Percent of total edible parts (carcass + edible offals) was higher for ration 2 (70.74%) , than 1 (69.63%) or 3 (68.98%).

5 . Mean meat percent (% of live weight) was higher and bone percent lower for broilers of ration 2 (53.04%, 11.84%, respectively) as compared with ration1 (51.49%, 11.96, respectively) or 3 (51.41%, 12.06%, respectively).

6 . Meat as percent of empty carcass was highest for broilers of ration 2 (81.75%), when compared with ration 1 (81.29%) or 3 (80.99%) .

7 . Meat to bone ration was highest and bone to meat ratio was lowest for broilers of ration 2 (4.48:1, 0.22: 1 respectivelt) than 1 (4.35:1, 0.23 : 1, respectively) or 3 (4.26:1, 0.24:1, respectively).

Results plotted for approximated values (Fig. 1) showed that although carcass weight (%) tended to be higher and total inedible parts (%) lower for broilers of ration 2 (followed by 1 then 3) , values for different factors, in particular the total edible viscera (%) were nearly similar . But one might observe that the average empty carcass weight, total of inedible parts and total of edible offals showed non-singificant difference (at 1% level) when control and 25% HFM treatments were compared. The difference, however, was significant (at 1% level) where 50% HFM was compared with either control or 25% HFM treatments. The best physical composition and carcass traits were recorded for broilers of ration 2, followed by ration 1, while ration 3 results were relatively less desirable. Such results indicated clearly that the quality of ration and diet ingredients affected to a great extend the weight composition (physical composition) and carcass traits of broiler, particulary with regard to proportion of meat , total edible parts as well as the meat to bone ratio.

II . Chemical analysis of meat:

Gross chemical composition of meat (breast + thigh) of broilers at 8 weeks of age as influenced by the level of HFM protein in ration is shown in Table 3.

It could be observed that broiler of ration 2 prepared with 25% HFM protein

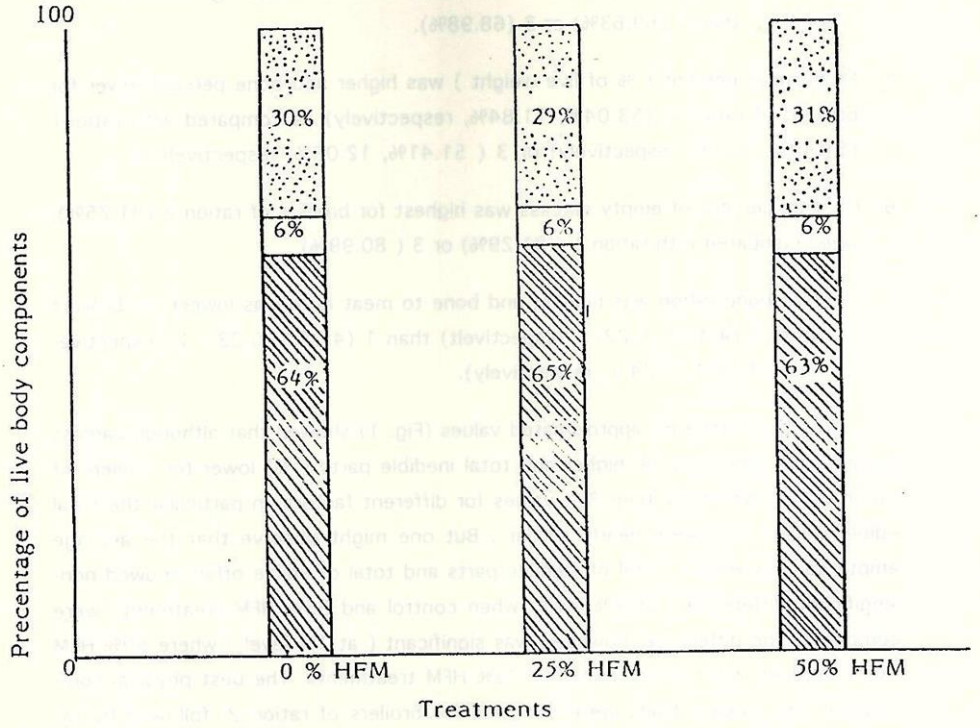

Fig. 1. Influence of ration on some carcass traits.

% Empty carcass weight

% Total edeble viscera

% Total inedeble parts

Table 3. Means of chemical analysis of whole meat breast and thigh of broilers at 8 weeks of age as influenced by the level of HFM

Rations	number of chicks	Chemical analysis of meat %								
		On wet weight basis					On dry weight basis			
		Moisture	Protein	Fat	Ash	Energy value (Cal/100gm)	Moisture	Protein	Ash	Energy value (Cal/100gm)
		x ± SE	x ± SE	x ± SE	x ± SE		x ± SE	x ± SE	x ± SE	
0% treated feather (control)	5	67.39a ± 0.009	21.65a ±0.009	9.91a ± 0.009	1.05a ± 0.009	175.79	66.39 a ±0.04	30.39 a ±0.02	3.22a ± 0.02	539.07
25% treated feather	5	69.46b ± 0.009	22.36b ± 0.006	7.05b ± 0.01	1.13b ± 0.09	152.89	73.22b ± 0.05	23.08b ± 0.03	.3.70b ± 0.03	500.60
50% treated feather	5	68.52c ± 0.04	22.29c ±0.01	8.1c ± 0.009	1.09c ± 0.01	167.06	70.81c ±0.05	25.73c± 0.02	3.46c ± 0.04	514.81

gave meat of significantly higher protein content when calculating on wet (22.36%) or dry (73.22%) weight basis, followed by ration 3 (50% HFM treatment , 22.29, 70.81%, respectively) or ration 1 (0% HFM treatment , 21.65, 66.39%, respectively). The moisture and ash followed the protein levels, and the differences between the three treatments were digificant too. Krilova and Liskovskaia (1968) reported that the higher the protein in a raw meat sample, the higher the moisture and ash , and the lower fat was mostly found.

According to Krilova and Liskovskaia (1968) Chicken meat is recommended for baby foods, patients, old people convalescents and subjects who suffer form obesity (due to low energy value) , where low calories meals are required. In this connection, broilers ration 2 (152.89 cal /100 gm wet weight basis) gave the best meat due to less calories, when compared with ration 3 and 1 (162.06 and 175.79 Cal /100 gm wet weight basis, respectively) . With regard to fat content , it was significantly less in case of treatment 2, when compared with treatments 3 or 1, the values were 7.05 , 23.08%; 8.10, 25.73% and 9.91, 30.39% on wet and dry weight basis, respectively.

Finally, processing of chicken feathers as a slaughter house waste to obtain the HFM used to replace 25% of protein in starting chickens ration, showed better results when compared with the control ration (0% HFM) with regard to weight composition, carcass traits and the nutritional value of meat.

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الاستفاده من ريش الدواجن في الطعام وفي العلائق : ٤- التركيب الوزني وخصائص الذبيحة وتحليل لحم الدجاج المغذي علي مستويات مختلفه من مسحوق الريش المحلل

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٢ المعمل المركزي لبحوث الصناعات الزراعية مركز البحوث الزراعية.
٣ قسم الإنتاج الحيواني - كلية الزراعة - مشتهر - جامعه الزقازيق.

ريش الدجاج الذي يعتبر من مخلفات المجازر بعد تحليله مائيا بالصودا الكاويه ثم المعاملة بحامض الايدروكلوريك والتجفيف للحصول علي مسحوق الريش المحلل، استخدم ليحل محل صفر ، ٢٥، ٥٠٪ من بروتين عليقه الكنترول المستخدمه في تغذية الكتاكيت (معاملة ١ - صفر ٪ مسحوق ريش محلل، معامله ٢ - ٢٥٪ مسحوق ريش محلل ، معامله ٣ - ٥٠٪ مسحوق ريش محلل) وقد وزع عدد ١٥٠ كتكوت نوع هابرد عشوائيا علي ٣ مجموعات غذيت علي العلائق الثلاثه المذكورة . وعند عمر ٨ أسابيع (نهاية مده تجربه التغذية) أختيرت ٥ طيور من كل مجموعة عشوائيا ثم ذبحت لدراسة تأثير استخدام مسحوق الريش المحلل علي التركيب الوزني وخصائص الذبيحة وتركيب لحم دجاج التسمين . وقد تم تحليل النتائج احصائيا.

وقد إتضح أن دجاج التسمين الناتج من التغذية على العليقة الثانية (٢٥٪ مسحوق ريش محلل) يعطي أعلي نسبه للذبيحة فارغة ، أعلي مجموع كلي للأجزاء المأكوله وأعلي مجموع للأحشاء المأكوله ، في حين يعطي أقل نسبه كلية للاجزاء غير المأكوله بالمقارنة بالتغذيه علي عليقه الكنترول والعليقه الثالثه (٥٠٪ مسحوق ريش محلل) وأعلي نسبه للحم (٪ من الوزن الحي أو ٪ من الذبيحة فارغة) وكذلك أعلي نسبه للحم الي العظام ،وأقل نسبه للعظام وكذلك أقل نسبه للعظام الي اللحم لوحظت في حاله المعامله الثانيه (٢٥٪ مسحوق ريش محلل) ودجاج التسمين الذي غذي علي العليقة الثالثه (٥٠٪ مسحوق ريش محلل) كانت جودته منخفضه معنوياً بالمقارنة بالمعامله الثانيه أو الأولي وقد إتضح أن أعلي نسبه بروتين وأقل نسبه دهن توجد في لحم دجاج التسمين للمعامله الثانيه التي كان لحمها منخفضاً معنوياً في الطاقة (عن المعاملتين الآخريتين)ولذلك فهي أفضل لبعض الفئات الحساسه ذات الأحتياجات الخاصه . وعلي أي حال فان تصنيع ريش الدجاج المتخلف في المجازر للحصول علي مسحوق الريش المحلل الذي يستخدم ليحل محل ٢٥٪ من بروتين علائق الدجاج يعطي أفضل تقييم بالمقارنه بعليقه الكنترول فيما يختص بالتركيب الوزني لدجاج التسمين وخصائص الذبيحة والقيمه الغذائية للحم.