

**** EFFECTS OF INCLUSION OF LOCAL DISPOSED
ROASTED FISH MEAL ON THE PERFORMANCE AND
CARCASS CHARACTERISTICS OF BROILERS**

By

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Abstract: *A study was carried on at central Sudan, in an open house and summer season, to evaluate the effect of incorporating the local disposed and roasted fishes of the White Nile River into broilers diets on their performance and meat characteristics. Four levels (0, 1.5, 3.5 and 5%) of the roasted fishmeal were used to replace the imported broilers' protein concentrates.*

The treated birds on levels of fishmeal inclusions showed no significant differences between them in the weekly feed intake and negligible differences in the feed conversion ratio. The weekly weight gains were almost similar in all treatments up to the 3.5% level but the higher inclusion (5%) represents the lowest weight gain.

The ready-to-cook carcass and the giblets of all levels of inclusions were almost similar except the 5% inclusion which showed the higher giblets weight, although the feathers' weight of the zero inclusion level ranking in the top weight, (this may hint to some sulfur amino acids deficiencies of roasted fish meal).

The panel test of carcass meat declared that, inclusions of 3.5% imported concentrates together with 1.5% of local roasted fish meal improved carcass meat quality, although there was no any mentioning of apparent fishy smell at any inclusion level.

There was no mortality recorded due to any inclusion level for the whole period.

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The study recommended that the locally wasted and disposed fishes of the White Nile River can be roasted and incorporated in broilers' diets replacing the imported concentrates with certain securing measures taken in packing and storing.

INTRODUCTION

Fish meal is an excellent source of protein. It is considered to be one of the best ingredient for broilers and layers, as it enhances the feed consumption and feed efficiency (Solangi *et al.*, 2002) and improves the egg production and feed conversion efficiency (Naulia and Singh, 1998).

Moreover, it contains all the essential amino acids, especially lysine and methionine, in adequate quantities required for poultry (Sing and Panda, 1990).

The nutrient composition of fish meal can vary depending on the type and species of fish, the freshness of the fish before processing and the processing methods. According to NRC (1994), protein content of fish meal varies from 60.00 to 72.30% due to type of fish and method of preparation. In Asian countries, fish meal is prepared from mixture of trash fish and byproducts of the canning industry, resulting in a product of very variable composition. In Pakistan, annually 40,000- 45,000 tons of fish meal is produced from different types of fish such as *Cirrhina mrigala*, *Trichogaster chuna*, *Johnius otolithus* and *Boricilius barila* (Nadeem, 2003). Indigenous fish meal varies in nutrient composition, with crude protein ranging from 32.00 to 58.80% (Choo and Sadiq, 1982).

In Sudan, at khor abugassaba (West White Nile, North Edweim, central Sudan were rice cultivated) about 15000 tons of spoiled and wasted fish were annually produced after rice harvesting (Salih, 2009)

The protein in fish meal has a high biological value in diets for animals. It is rich in the essential amino acids, particularly lysine and the sulfur amino acids. The presence of fish meal in a complete diet will supplement any deficiencies of the amino acids in vegetable protein, such as soybean meal (Barlow and Windsor, 1984; Miles and Jacob, 1997). Fishmeal is also fed to farm animals not only to improve productivity, but also to protect health and welfare and reduce dependence on antibiotics and other drugs (Pike, 1999; Anonymous, 2002).

The quality of fish meal is often questioned due to adulteration with cheap diluents such as sand, stone, soil, fine sawdust, horns and hooves, blood meal,

Animal oil, prawn, poultry byproducts and wastes of tannery (Nadeem, 2003; Hossain *et al.*, 2003).

This study was carried to evaluate the locally disposed roasted fishmeal incorporated in commercial poultry diets replacing imported protein concentrates, and its effects on the performance and meat characteristics of broilers.

MATERIALS AND METHODS

This study was carried on at the Extension and Rural Development Centre,

Faculty of Animal Production, University of Gezira at Elmanagil during the period from the first week of May up to the second week of June 2008.

1-Preparation of experimental roasted fishmeal:-

A quantity of 30kgs disposed, trash, spoiled and sun dried fishes, from the White Nile, were randomly taken and been crushed by electric beef meat chopper, powered in a special locally designed metal drum to be used as a rooster. The roasting drum was exposed to a charcoal fire (flames), and manually turned and rotated for 15 minutes. The roasted quantity was stored in a plastic bag with inner sheath to avoid moisture and microorganisms then, a sample of 300grms of it were taken and proximately analyzed.

2- Preparation of experimental diets:

Table(1):Experimental diets (%ages):

Feed Ingredient	Control diet 0%Fish meal	1.5% roasted fish meal	3.5% roasted fish meal	5% roasted fish meal
Sorghum	60.0%	60.0%	60.0%	60.0%
Wheat bran	12.5%	12.5%	12.5%	12.5%
Groundnut cake	18.5%	18.5%	18.5%	18.5%
Imported concentrates	05.0%	01.5%	03.5%	--
Local roasted fish meal	--	03.5%	01.5%	05.0%
Bone meal	02.25%	02.25%	02.25%	02.25%
Salt(NaCl)	0.25%	0.25%	0.25%	0.25%
Oyster shell	1.25%	1.25%	1.25%	1.25%
Vits.	0.25%	0.25%	0.25%	0.25%
Total	100.00%	100.00%	100.00%	100.00%

Local feed ingredients (sorghum, wheat bran, groundnut cake, bone meal, sodium salt ,oyster shell and vitamins) were used to formulate the experimental diets. The imported broiler protein concentrates5 %(Intraco® Ltd),had been used as animal protein in the control diet. Three other isocaloric and isonitrogenous (3300kcal ME /kg &23% crude protein) experimental diets with 1.5, 3.5and5% levels of locally roasted fishmeal were formulated and incorporated in the broiler diets replacing super concentrates5%. The locally roasted fish meal used composed of 61% crude protein,3.6% crude fat,2.3%moisture,21.1%ash, 22% available

carbohydrates and 2643.06kcal /kg ME (ME calculated to the equation of Lodhi et. al.(1976), $ME(Kcal/kg)=32.95(\%crude\ protein+ \%ether\ extract \times 2.25+ available\ carbohydrates) - 29.2$).

The four experimental diets were stored in plastic bags with inner sheath and every bag was marked (A for the control and B, C, D for 1.5, 3.5 and 5% roasted fish meal respectively) and properly stored.

3- Experimental birds:

Eighty broiler chicks ,one day old, of the Ross breed , had been used and randomly divided to 4 groups (twenty birds/treatment).Every treatment was replicated 4times(5birds/replicate).All replicates were fed control diets for the first week as pre-experimental period and the experimental diets were then offered to birds from the starting of the second week.

4- Experimental design:

Completely Randomized Design (CRD) was used and the experimental cage (width 8m² and 1.8m height) had been segmented to 16 replicates (1x0.5m for each replicate) and the cage cemented floor was covered by sand and over it saw-dust was powered before entering the experimental chicks. A lamp of 40 watt at the inner-upper middle of the cage was used and daily lightened on.

5-Collected data:-

- **Feed intake** (weekly weighed and measured, divided by the live birds in the treatment to find the daily mean of feed intake(g/bird/day).

-**Weight gain** (weekly weighed& measured, divided by the live birds in the treatment to find the mean of body weight gain(g/bird/day).

-**Feed conversion ratio (FCR)** (weekly measured, as g feed intake /g weight gain for each bird).

-**Final live body weight** (at the slaughtering age of 6weeks by weighing the slaughtered birds and divided by their numbers to obtain the mean of each bird weight).

- Carcass characteristics:

***Carcass weight** (directly after slaughtering, defeathering& evacuating, without heads and legs).

***Feather weight** (manual de-feathering after emerging in hot water) .

***Giblets weight** (liver and empty gizzard).

* **Meat quality test** (boiled meat by tap water for 5 minutes, panel test applied by 64 participants).

-**Mortality** (daily, with footnotes on death causes and symptoms).

RESULTS AND DISCUSSION

(A) Broilers Performance:

The statistical package of social sciences computing program (2001) was used to analyze the obtained results.

Table (2): Feed Intake (g/bird/day) ±(Mean Sd.)

Experimental period	Control diet(0%fish meal)	1.5% roasted fish meal	3.5% roasted fish meal	5% roasted fish meal
1 st week	24.600 ±2.40	24.000±1.53	23.335±2.71	24.150±2.92
2 nd week	35.875 ±2.47	36.700±2.43	32.725±1.91	31.800±1.69
3 rd week	60.725±0.49	60.750±0.50	60.893±5.37	3.86±54.750
4 th week	68.075±7.15	84.733±13.44	88.900±24.29	66.300±21.73
5 th week	72.625±14.83	86.850±33.71	84.980±51.25	70.735±29.63
6 th week	71.980±15.40	92.078±19.26	98.423±28.92	93.900±19.86
Total feed intake(6weeks)	55.646±20.70	64.301±30.67	64.876±37.19	56.939±28.54

It is obvious that there was no any significant difference for feed intake between the diets containing imported protein concentrates and the different levels of local treated fish meal up to 5%. The means of the total feeds consumed at the end of the experimental period showed apparently equal without significant difference .

These results approved with Solangi *et al.*, 2002, Naulia and Singh, 1998 and Sing and Panda, 1990 findings and completely agreed with them.

Table (3) Weight gain (g/bird/day): (Mean± Sd.)

Experimental period	Control diet(0% fish meal)	1.5% roasted fish meal	3.5% roasted fish meal	5% roasted fish meal
1 st week	1.215± 0.384	1.095±0.158	1.178±0.508	0.965±0.269
week 2 nd	2.195±0.466	1.940±0.915	1.680±0.358	3.675±4.151
week 3 rd	4.020±1.003	4.855±0.634	3.375±0.842	2.365±0.806
week 4 th	5.500±0.583	11.825±9.403	6.950±5.224	7.575±6.395
week 5 th	6.700±4.024	5.780±2.905	5.025±2.980	12.335±11.763
6 th week	5.092±1.179	11.550±11.517	11.810±7.919	8.650±1.974
Mean of total live body weight gain (g/bird/day)	4.120±2.507	6.242±7.028	5.003±5.166	5.928±6.520

The daily weight gain showed no significant difference up to 3.5% inclusion of locally treated fish meal although high rate of inclusion(5%) compensated(weighed more) in the last weeks .The growth rate of 5% fish meal inclusion was not similar to the others and showed some retardness in the first weeks but also compensated and tackled with the others in the last two weeks.

The total final gained weight of the birds of 1.5and 3.5% inclusions of treated fish meal were almost typically the same and compromised with control bird's with negligible differences..

These findings may lead to and need more analytical treatments for the essential amino acids content of the treated fish meal, especially lysine and methionine.

Table (4): Feed Conversion ratio (FCR) (gram feed (Mean± Sd.): gram weight gained)

Experimental period	Control diet(0% fish meal)	1.5% roasted fish meal	3.5% roasted fish meal	5% roasted fish meal
1 st week	22.375 ±6.653	22.550±5.000	21.950±7.546	4.305±26.000
2 nd week	16.725 ±3.317	7.975±21.700	20.300±5.001	18.825±1.291
3 rd week	15.600 ±3.132	12.600±1.463	18.975±5.35	25.825±6.665
4 th week	12.500 ±2.383	24.025±9.500	24.550±14.551	17.650±8.983
5 th week	19.550±22.352	41.525±50.022	22.850±24.301	14.650±8.248
6 th week	18.260±7.345	24.650±26.435	9.625±3.968	11.475±3.952
Mean FCR	17.502±9.565	24.508±22.764	19.708±12.070	7.742±19.070

Concerning the feed efficiency ratio, feeding the control diet showed an optimum feed conversion ratio and can be categorized as the premium value(although there was no significant difference) but the three tested fish meal levels showed typical values. These findings maybe need to economical studies to evaluate the costs between the imported protein concentrates and the locally treated fish meal and this agreed with Salih (2009).

(B)Carcass characteristics and meat quality :

Table (5): Carcass characteristics as feeding inclusion different levels of local fish meal

Parameter observed	Control diet(0% local fishmeal)	1.5% roasted fish meal	3.5% roasted fish meal	5% roasted fish meal
Carcass weight: defeathered and evacuated(g) (Ready-to-cook)	881.9	766.7	786.7	797.5
Feather weight(g)	107.5	87.5	76.6	90.6
Empty Giblets weight(g)	56.9	56.3	55.0	61.6
Total weights(g)	1046.3	910.5	918.3	949.1

The control carcasses weights was the upper followed by the 5%,3.5%and 1.5% of roasted fish meal inclusions successively, although there was no significant difference between the four treatments. The feather and giblets weight were in the same manner as the carcass weight with negligible differences, but the giblets of 5% roasted fish meal inclusion showed a higher weight. These results may resumed that the locally disposed and roasted fishmeal can be used in broilers diets and totally replaced imported protein concentrates, at least from the economical point of view, Salih(2009).

Table(6): Meat quality tests of broilers fed inclusion different levels of local fish meal(Panel Test%):

Panel Test Degrees& % ages	Control diet(0%fish meal)	1.5% roasted fish meal	3.5% roasted fish meal	5% roasted fish meal
Color				
1-Excellent	55.0	87.5	38.8	68.8
2-Very good	35.0	12.5	29.4	25.0
3-Good	10.0	--	11.8	6.2
4-Low	--	--	--	--
Totals	100	100	100	100
Odors				
1-Excellent	63.6	81.3	47.1	56.2
2-Very good	27.3	18.7	35.3	31.3
3-Good	9.1	--	17.6	12.5
4-Low	--	--	--	--
Totals	100	100	100	100
Tenderness				
1-Excellent	61.1	58.6	68.7	53.3
2-Very good	33.3	34.3	25.0	40.0
3-Good	5.6	7.1	6.3	6.7
4-Low	--	--	--	--
Totals	100	100	100	100
Juiciness'				
1-Excellent	56.6	61.9	47.1	43.7
2-Very good	21.7	23.8	35.3	50.0
3-Good	21.7	14.3	17.6	6.3
4-Low	--	--	--	--
Totals	100	100	100	100
Smell				
1-Excellent	52.2	55.6	43.7	31.3
2-Very good	39.1	44.4	18.7	37.4
3-Good	8.7	--	31.3	31.3
4-Low	--	--	6.3	--
Totals	100	100	100	100

The panel test declared that incorporating 3.5% of imported protein concentrates plus 1.5% of locally roasted fish meal into broilers diets improved the color, odors and juiciness of the broiler carcass meat but other characteristics showed almost negligible differences. It may be due to the lower costs of broilers diets in Sudan and the fear of using local fish meal was disappear.

Mortality:

Through the whole experimental growth period, only 5.6% of mortality was occurred (7birds), although this study had been applied in hot summer and in an open house, however these birds recorded as an accidental occurrence, e.g. Sophistication in drinkers, twisted neck in the cage wire and injured with weighing.....etc. The mortality occurred consist of 4 birds from 3.5% inclusion, 2birds for 1.5%, one bird for the controls and no any mortality recorded for the 5% inclusion of roasted fish meal. This may indicate that roasting of the locally disposed fish meal can suppressed the activity of its' fatal microorganisms'.

Conclusion and Recommendation:

Economically the locally roasted fish meal costed half of the costs of the imported protein concentrates, Salih(2009).

It can be concluded that locally roasted fish meal can be used(with some measures in packing and storing) in the broiler diets in up to 5% replacing the imported protein concentrates additionally, it may need applying some of the essential synthetic amino acids to be added .

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الملخص العربي

أثر استخدام بكرة الاسماك المحلية التالفة والمعاملة بالتحميص في أعلاف الدواجن وأثره على أداء الانتاجي وخواص الذبيحة للدجاج اللاحم
أجريت تجربة على كتاكيت للاحم وفي مسكن مفتوح في وسط السودان بغرض تقييم أثر إضافة أسماك النيل الأبيض التالفة بعد معاملتها بالتحميص وأثر ذلك على الأداء الانتاجي وخواص الذبيحة .

استخدمت أربعة مستويات من مسحوق الأسماك المحمصة (صفر، ١.٥، ٣.٥، ٥%) لتحل محل المركبات البروتينية المستوردة.

أظهرت نتائج التجارب عدم وجود فروق معنوية بين كل مستويات الإضافة فيما يخص الاستهلاك الأسبوعي من العلف وأن الاختلافات في الكفاءة التحويلية للغذاء بين المعاملات.

أما الوزن المكتسب الاسبوعي فكان متساوياً في كل المعاملات حتى المستوى الثالث من الإضافة (٣.٥%) أما إضافة ٥% من السمك المحمص فأظهرت نتائجها أقل الأوزان . ووزن الذبيحة الجاهزة للطبخ ووزن الحلويات متساوياً تقريباً بين المعاملات ما عدا إضافة ٥% من مسحوق السمك المحمص حيث سجلت أعلى وزن للحلويات ، أما بالنسبة لوزن الريش فكان أعلى وزناً في المعاملة الخالية من بكرة مسحوق السمك المحمص (وهذه إشارة بأن هنالك بعض النقص في الأحماض الأمينية المحتوية على عنصر الكبريت في بكرة مسحوق السمك).

أظهرت لجان التحكيم (الذواقة) على مواصفات الذبيحة أن إضافة ٣.٥% مركبات مستوردة مع ١.٥% من مسحوق بكرة السمك المحلية المحمص أعطت أفضل النتائج في المواصفات علماً بأنه لم ترد إشارة واحدة بأن هنالك رائحة ملحوظة في أي من مستويات الإضافة.

فيما يخص نسبة النفوق فانه لم تسجل حالة نفوق واحدة تسبب فيها أي مستوى من إضافات مسحوق بكرة السمك المحمص خلال مدة التجربة.

أوصت الدراسة بأنه يمكن الاستفادة من الأسماك التالفة والمهدرة من أسماك النيل الأبيض بعد تحميصها وإضافتها إلى أعلاف كتاكيت اللاحم لتحل محل المركبات المستوردة مع بعض الاحتياطات أثناء التعبئة والتخزين لمسحوق الأسماك المحمص وكذلك الأعلاف التي تحتويها.