Original Research Article

Effect of Feeding Locally Produced Soybean Meal and Fishmeal on the Performance of Broiler Chicks

Abstract: This study was carried out to determine the effect of the inclusion of Soybean meal and fish meal on the broiler chicks performance.A total of 160unsexed day-old chicks were used in this study and distributed randomly into 16 pens (10/pen) as replicates in a completely randomized design. The chicks were assigned to four experimental diets: Diet A containing imported concentrate, Diet B containing a mixture of 75 % of soybean and 25 % fish meal, Diet C containing 25 % the imported concentrates and 75% the mixture, and Died D containing 50% imported concentrates and 50% of the mixture. Feed intake, feed conversion ratio, body weight gain and mortality rate were recorded weekly, while the carcass weight, dressing percentage, weight of the internal organs (liver, spleen, heart and abdominal fat) and serum contents (blood cholesterol, total lipids, glucose, albumen and protein) were determined at the end of the experimental period.. The results showedthat the birds fed Diet A consumed significantly (P≤0.01) higher feed (3728.4 g) and gained more life weight (1818 g). The feed conversion ratio was not affected by treatments, although the birds fed diet A recorded the best value (2.05). For carcass weight and dressing percentage, the birds fed diet A recorded the highest values 1551.25g and 72.28% respectively. The same trend was reported in the internal organs liver, Heart, and Fats wherein diet A recorded the highest value 60.0, 12.5 and 23.1g, respectively. For blood biochemical, the birds fed diet A had the highest value of protein, cholesterol, and lipids while diet the birds fed diet B recorded the highest value of glucose. It could be concluded that the inclusion of locally prepared Soybean and fish meal reduced the performance of the broiler chicks and the control diet had the best broiler performance.

Keywords: Soybean meal, Fish Meal, Broiler performance

Introduction

Commercial broiler production has become a specialized and speedypoultryoperation in recent years all over the world (Kairalla et al., 2022a). Total consumption of poultry meat has increased dramatically during the past five decades and continues to increase ahead of human population growth [1, Alshelmani et al., 2021a, 2021b, Kairalla et al., 2022b)].Successful broiler rearing depends on many factors like availability of feed ingredients at a reasonable cost, proper management and quality chicks [2].Feeding cost amount to about 70% or more in the poultry industry. Optimal rations should satisfy the nutrient requirements of birds and be economically feasible [3].Moreover, the prices of protein ingredients are comparatively higher than that of the other ingredients; protein costs involve about 45%~~percent~~ of the total feed cost. Nowadays, the cost of feed

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Comment [NS2]: Please add:
Alshelmani, M. I., Kaka, U., Abdalla, E. A., Humam, A. M., & Zamani, H. U. (2021). Effect of feeding fermented and non-fermented palm kernel cake on the performance of broiler chickens: a review. *World's Poultry Science Journal*, *77*(2), 377-388.

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ingredients has steadily increased all over the world. This is not only an inflationary factor but also for a reduction in the availability of poultry feed ingredients [4]. In Sudan, concentrates have been used till now in poultry production due to their vital role to complete the protein and microelements in poultry feed to maximize the growth performance of birds. Today the poultry industry, in Sudan faced a feed crisis because of the high cost of production which is attributed to raising in the cost of feed ingredients mainly imported concentrates. Now there were many attempts by nutritionists to replace the imported concentrate with different locally available protein sources [5],completely replacing imported concentrate with synthetic lysine and methionine and they recorded significant improvement in the chick's performance [6].Traditionally, protein needs in poultry ration are met up mainly with vegetable proteins plus a little amount of animal protein [7].Soybean is not only a source of high-quality edible oil for humans, but also a high quality-vegetable protein in animal feed worldwide. Its universal acceptability in animal feed has been due to favorable attributessuch as relatively high protein content and suitable amino acid profile except for methionine, minimal variation in nutrient contents, ready availability year-round, processed. ~~Also~~In addition, attention has been focused on soybean utilization as an alternate protein source in animal diets due to the changing availability or allowed uses of animal proteins coupled with relatively low cost [8].In a broiler ration, fish meal, meat, and bone meal and other protein concentrates are predominantly the principal ~~Sources~~ sources of animal protein [4].Fish meal is an excellent source of protein. It is considered to be one of the best ingredients for broilers and layers, as it enhances feed consumption and feed efficiency [9].It is high in protein, energy, minerals (~~Calcium~~ calcium and ~~Phosphorus~~phosphorus), a natural source of vitamins (including choline, biotin and vitamin B12, A and E) and microelements, selenium and iodine. Moreover, it contains all: the essential amino acids, especially lysine and methionine, in adequate quantities required for poultry. Its enhancement of diets for young bird's growth factors [10].

The objective of this study is to evaluate the replacement of the imported concentrate by the concentrate made of soybean and fish meal in different ratios on the performance of broiler chicks.

Material and Methods:

Experimental Site, Duration, and Housing:

The study was carried out in poultry experimental houses, Faculty of Animal Production, Khartoum University at Shambat, during the period from 12 December to 5 February 2013, in temperature ranging between 22 - 30^0 C. The house was partitioned into 16 pens each of them ~~have~~has one-meter dimension.

Experimental Birds and Design:

A total of 160 unsexed day-old Ross commercial broiler chickens were used in the study. The chicks were ~~weighted~~ weighed and randomly divided in to four treatments with replicates of 10 chicks.

Comment [NS3]: How many replicate?

Experimental Diets:

~~soybean~~Soybean and fish meal which were used in the experiment were purchased from Shambat market and milled to get the meal. The chicks were assigned to the four experimental diets, which were divided as follows: Diet **A** was the control, containing only an imported super concentrate, Diet **B** containing 100% soybean and fish meal (containing 75 % of soybean and of 25 % fish meal), Diet **C** was containing 25 % of imported concentrates and 75% of the mixture, and Died **D** containing 50% imported concentrates and 50% of the mixture. The inclusion of these diets was at 5% of the feed.

Parameters Measured:

Feed intake and body weight gain were measured weekly. At the end of the experiment, the birds were fasted overnight except for water. Four birds from each replicate were randomly selected then Leg labeled and individually weighed. They were manually slaughtered without stunning(Alshelmani et al., 2016). Birds were slaughtered at six weeks of age. The hot carcass weight was recorded. Internal organs were weighed mainly liver, gizzard, spleen, heart, and abdominal fat. Blood samples were collected from two randomly selected birds from each cage to determine serum cholesterol, triglycerides and glucose contents using commercial kits.

Comment [NS4]: Please add:
Alshelmani, M. I., Loh, T. C., Foo, H. L., Sazili, A. Q., & Lau, W. H. (2016). Effect of feeding different levels of palm kernel cake fermented by Paenibacillus polymyxa ATCC 842 on nutrient digestibility, intestinal morphology, and gut microflora in broiler chickens. *Animal Feed Science and Technology*, *216*, 216-224.

Chemical analysis:

A sample of experimental diets were analyzed for approximate composition on a dry matter basis according to AOAC methods [11]and presented in table (1)

Statistical analysis:

Analysis of variance was done by Statistical Analysis System (SAS) version 9.1, software program, using one-way ANOVA. Results were shown as mean, mean separation is done by Duncan Multiple Range Test according to [12] and the significance different at ($P<0.05$).

Table (1) Determined of Chemical Composition of the Experimental Diet

~~Ingresients~~Ingredients %	Experimental Diets			
	A	B	C	D
Crude protein	21	22.75	21	21

Crude fiber	9.7	9.86	10.6	1.56
Ether extract	4.36	8.6	4.8	6.03
Ash	6.86	5.1	4.92	5.56
DM	96.86	95.92	96.6	96.45

Comment [NS5]: Please double check!

Results

The effect of different levels of inclusion of soybean meal and fish meal on the feed intake of broiler chick is shown in table (2). The data showed that there was a significant difference in all weeks except week three and six. The group of birds fed diet D consumed less feed, while the birds fed the control diet consumed the highest feed.

Table (2)The Effect of Dietary Treatments on Weekly Feed Intake (g).

	Treatments				
Weeks	**A**	**B**	**C**	**D**	**P –Value**
Week1	291.6[a]	145.8[c]	211.7[b]	104.5[c]	0.00
Week2	498.5[a]	338.25[c]	396.25[b]	393.13[b]	0.00
Week3	581.90[a]	424.63[a]	477.24[a]	408.5[a]	0.92
Week4	775.42[a]	481.43[ba]	726.0[a]	558.16[b]	.001

Week5	961.66[a]	649.08[c]	864.90[b]	820.14[b]	0.001
Week6	1109.3[a]	771.3[b]	1006.6[b]	922.8[ab]	0.072

Comment [NS6]: You mentioned that significant was (P<0.05). However, this p-value is 0.072? Please check and revise again!

a, b, c means with different letters in the same ~~raw~~ row are statistically different at (P<0.05).

A: Control Conc. **B**: Mixture (soybean 75+25 fish meal).

C: 25 conc. +75 mixture. **D**: (50 imported conc. + 50 mixture.)

Data on the weight gain of broiler chicks as affected by different treatments was presented in table (3). In all weeks there was a highly significant difference (P≤0.01) between treatments. The group of birds fed the imported super concentrate recorded the highest value of weight gain, while the lowest value of weight gain was secured in a group of birds fed diet D.

Table (3)The Effect of Dietary Treatments on the Body weight (g) per Weeks.

	Treatments				
Weeks	**A**	**B**	**C**	**D**	**P - Value**
Week1	321.87[a]	199.37[bc]	249.87[b]	179.87[c]	**0.000**
Week2	579.62[a]	327.62[c]	452.50[b]	356.00[c]	**0.000**
Week3	948.77[a]	547.37[c]	686.92[b]	616.00[bc]	**0.000**
Week4	1195.75[a]	753.7[c]	1016.50[b]	966.00[b]	**0.000**
Week5	1627.75[a]	994.25[c]	1300.50[b]	1269.75[b]	**0.000**

Week6	2052.0[a]	1198.00[c]	1602.75[b]	1704.75[b]	**0.000**

a, b, c means with different letters in the same ~~raw~~ row are statistically different at (P<0.05).

A: Control Conc. **B**: Mixture (soybean 75+25 fish meal).
C: 25 conc. +75 mixture. **D**: (50 imported conc. + 50 mixture.)

The effect of different inclusion of soybean meal and fish meal on the weight gain of broiler chick is shown in table (4). The data showed that there was a highly significant difference (P≤0.01) in all weeks except weeks six, the bird fed diet A outnumbered the other weeks, while in week six the trend is variable.

Table (4)The Effect of Dietary Treatments on Weight Gain (g) in Each week

	Treatments				
Weeks	**A**	**B**	**C**	**D**	**P –Value**
Week1	187.75[a]	78.27[b]	118.00[b]	50.13[b]	0.008
Week2	257.75[a]	128.25[c]	202.63[ab]	176.13[bc]	0.007
Week3	274.86[a]	181.63[c]	192.40[bc]	238.94[ab]	0.008
Week4	309.22[a]	190.82[b]	292.94[a]	350.25[a]	0.008
Week5	432.29[a]	207.19[b]	278.62[b]	278.62[b]	0.005

Week6	379.94^{ab}	166.42^{c}	434.92^{bc}	434.90^{a}	0.011

a, b, c means with different letters in the same ~~raw~~ row are statistically differentat (P<0.05).

A: Control Conc. **B**: Mixture (soybean 75+25 fish meal).
C: 25 conc. +75 mixture. **D**: (50 imported conc. + 50 mixture.)

Table (5) noted the effect of different dietary treatments on feed conversion ratio. No significant difference was found between parameters in all weeks. The trend is quite variable, but the control diet secured the best value of feed conversion ratio.

Table (5)The Effect of Dietary Treatments on Weekly Feed Conversion Ration

	Treatments				
Weeks	**A**	**B**	**C**	**D**	**P –Value**
Week1	1.60	1.9825	1.95	3.36	0.21
Week2	1.98	2.6850	2.03	2.29	0.08
Week3	1.49	2.3975	2.3825	1.76	0.11
Week4	2.57	2.7625	2.55	1.59	0.099
Week5	2.25	3.33	3.2075	3.12	0.109
Week6	**2.43**	4.7	4.1500	2.02	0.15

Comment [NS7]: ?? It is too high and no significant!

a, b, c means with different letters in the same ~~raw~~ row are statistically different at (P<0.05).

A: Control Conc. **B**: Mixture (soybean 75+25 fish meal).
C: 25 conc. +75 mixture. **D**: (50 imported conc. + 50 mixture.)

The data in table (6) noted the effect of different treatments on the carcass parameters. For life weight and carcass weight, the results showed that there was a significant difference between the four diets, the group of birds fed the control diet secured the highest value of life weight (2128.75 g) and carcass weight (1551.25), while the worst life and carcass weight was recorded for the birds fed diet (B) 1275 and 824.37 respectively. For dressing percentage, a significant difference ($P \leq 0.05$) was observed between treatments, the birds fed diet A had the highest value (72.28), followed by diet D, B and the least diet C. The same trend was found in the internal organs liver, Heart, and Fats wherein diet A recorded the highest value, while diet B showed the lowest value.

Table (6)The Effect of Dietary Treatments on Carcass Parameters of Broiler Chicks

Measurments	**Treatments**				
	A	**B**	**C**	**D**	**P-Value**
Live weight	2128.75[a]	1275.0[c]	1824.37[b]	1786.87[b]	0.00
Carcass weight	1551.25[a]	824.37[c]	1163.75[b]	1196.25[b]	0.00
Dressing%	72.28[a]	64.65[b]	63.62[a]	66.92[a]	0.003
Liver%	60.00[a]	36.25[c]	45.62[b]	50.00[b]	0.00
Heart%	12.50[a]	9.37[a]	11.25[a]	11.25[a]	0.154

Fat%	23.12[a]	9.37[b]	20.00[a]	22.50[a]	0.00

a, b, c means with different letters in the same ~~raw~~ row are statistically different at (P<0.05).

A: Control Conc. **B**: Mixture (soybean 75+25 fish meal).
C: 25 conc. +75 mixture. **D**: (50 imported conc. + 50 mixture.)

Table (7) showed the effect of different treatments on overall performance. For feed intake and body weight, the data revealed that the birds fed diet A consumed (P≤0.01) more feed (3728.4) and gained more weight (1818.7 g), while group B consumed less feed (2801.33) and had the worst (97.5) body weight. For feed conversion ratio, no statistical difference was reported between the treatments (P>0.05). The best value was of FCR maintained by group fed diet A (2.05), while the worst FCR was reported for the birds fed diet C.

Table (7)The Effect of Dietary Treatments on Overall Performance of Broiler Chicks

Measurments	**Treatments**				
	A	**B**	**C**	**D**	**P-Value**
Feed intake	3728.44[a]	2801.33[c]	3669.55[a]	3194.14[b]	**0.000**
Body weight	1818.7[a]	972.5[c]	1265.36[b]	1342.07[b]	0.000
Weight gain	852.03[a]	400.00±[a]	318.2[a]	279.5[a]	**0.107**
FCR	2.050[a]	2.88±0.14[a]	2.90±0.40[a]	2.38±0.08[a]	**0.051**

a, b, c means with different letters in the same ~~raw~~ row are statistically different at (P<0.05).

A: Control Conc. **B**: Mixture (soybean 75+25 fish meal).
C: 25 conc. +75 mixture. **D**: (50 imported conc. + 50 mixture.)

The inclusion of different levels of soybean meal and fish meal with the imported super concentrate on blood biochemical revealed a significant effect on protein, cholesterol, and lipids, while no significant effect was noticed in the glucose and Albumin table (8). For protein,

cholesterol, and lipids the highest value was recorded in diet A which were 4.13, 115.2, and 393.8 respectively. While the highest value of glucose and albumen was found in diet B

Table (8)The Effect of Dietary Treatments on blood Biochemical of Broiler Chicks

Measurements	**Treatments**				
	A	**B**	**C**	**D**	**P-Value**
Protein	4.13[a]	3.63[ab]	3.06[bc]	2.84[c]	**0.002**
Albumin	1.54[a]	1.54[a]	1.39[a]	1.32[a]	**0.307**
Cholesterol	115.21[a]	88.85[b]	84.14[b]	95.37[b]	**0.003**
Glucose	201.18[a]	210.67[a]	185.09[a]	174.25[a]	**0.196**
Lipids	393.28[a]	245.73[b]	256.36[b]	231.28[b]	**0.000**

a, b, c means with different letters in the same ~~raw~~ row are statistically different at ($P<0.05$).

A: Control Conc. **B**: Mixture (soybean 75+25 fish meal).
C: 25 conc. +75 mixture. **D**: (50 imported conc. + 50 mixture.)

Discussion

Feeding cost amount to about 70% or more in the poultry industry. Optimal rations should satisfy the nutrient requirements of birds and be economically feasible. This study is an attempt to find a new alternative of the imported super concentrates in the broiler rations. The effect of different inclusion of soybean meal and fish meal on the weekly feed intake of broiler chicks and the overall feed intake revealed a significant difference between parameters, the birds fed the imported super concentrate consumed more feed that the other groups. This finding is similar to that of [13] and [14] who reported that the highest feed intake was recorded for the birds fed imported concentrate when compared to the locally made concentrate. This result is likely to be related to better availability of nutrients from the protein of the imported concentrate in the digestive tract of broiler chickens, moreover, the combinations between fish meal and soybean meal may affect the palatability of the diet because the fishy smell in the fish meal and the trypsin inhibitor in the soybean meal may result in a reduction in feed intake.

Highly significant variation was found in weekly body weight and overall life body weight as affected by different treatments. The imported super concentrate (the control) recorded the highest feed intake in both weekly and final body weight, while the diet D (50 imported conc. + 50 mixture) had the lowest weekly gain and Diet B (Mixture of 75 % soybean +25% fish meal) had the worst final body weight. This result may be attributed to the lower feed consumption which was noted in this result to the locally made concentrate thus leading to a deficiency in essential amino acids. This results were in the line with the results obtained by [13] who found the imported concentrate secured the highest body weight in all six weeks except week one. Contrary, these results were not in the line with the results obtained by [14], [15], [10], and [16] who found that body weights were similar in the chicken fed the diet with the local concentrate compared to the imported concentrate.

No statistical difference was reported between the treatments in term of feed conversion ratio, the best value of FCR was maintained by a group of birds fed the control diet while the worst FCR was reported for the birds fed diet containing 25 imported conc. +75 mixtures. Changes in feed conversion ratio in chicks relate mainly to the type of diet rather than the breed, age and sex, moreover, the lowest weight gain may result in poor feed conversion ratio. The results obtained in this could be comparable to that obtained by [13] who indicated that no significant difference was obtained between local and imported concentrate for FCR. [17] found that FCR was significantly different among birds fed fish meal, Soybean meal, and Poultry by-product Meal, the FCR of birds fed FM diets was poorer than birds fed SBM and PBM diets. Similar results were reported by [18] who found that the feed conversion ratio was poorer for diets containing plant concentrate in comparison to the imported control.

A higher carcass weight was recorded among chicks fed imported concentrates compared to other diets, while the birds fed diet A had the highest value followed by diet D, B and C. The same trend was found in the internal organs liver, Heart, and Fats wherein diet A recorded the highest value, with the least value recorded for diet B. These results are similar to that obtained by [17] who stated that birds fed soybean meal and poultry by product meal had significantly greater body weight ($P \leq 0.05$) than those fed fish meal diets. [15] noted that there was no significant difference in the use of locally manufactured protein concentrate on the carcass traits (carcass weight, dressing percentage, relative weight of main cuts and abdominal fat). Moreover, [19] indicated that there were no significant differences on the carcasses weights and the relative weight of the main cuts (breast and thigh) when used the poultry slaughterhouse waste powder as a source of protein into broiler diets in ratios.

The inclusion of different levels of soybean meal and fish meal with the imported super concentrate on blood biochemical revealed a significant effect on protein, cholesterol, and lipids, while no significant effect was noticed in albumin and glucose. For protein, cholesterol, and lipids

the highest value was recorded in diet A, while the highest value of glucose and albumen was found in diet B. these results are similar to that found by [18] who stated that the lowest level of serum cholesterol was observed in birds fed plant concentrate while the highest level was obtained in birds fed on control diets. [20]noted that on the observation of blood profile studies after treatment of different levels of SHR there was an increase of Hb, PCV and ESR concentration in the birds but they were not satisfactory significant, they reported that hematological parameters remain unchanged even though after fed different level of protein.

References

Alshelmani, M. I., Loh, T. C., Foo, H. L., Sazili, A. Q., & Lau, W. H. (2016). Effect of feeding different levels of palm kernel cake fermented by Paenibacillus polymyxa ATCC 842 on nutrient digestibility, intestinal morphology, and gut microflora in broiler chickens. *Animal Feed Science and Technology*, *216*, 216-224.

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Kairalla, M. A., Alshelmani, M. I., & Aburas, A. A. (2022). Effect of diet supplemented with graded levels of garlic (Allium sativum L.) powder on growth performance, carcass characteristics, blood hematology, and biochemistry of broilers. *Open Veterinary Journal*, *12*(5), 595-601.

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1- Hossain M. H., Ahammad M. U. and Howlider M. A. R.(2003)Replacement of Fish Meal by Broiler Offal in Broiler Diet. International Journal of Poultry Science 2 (2): 159-163, 2003.

2- Hossain M. D., Bulbul S. M. and Howlider M. A. R. (1989). The composition of some unconventional feeds. Poult. Adv., 22: 37-40.

3- Seham A. K., Mahgoub G. E., Eiman, E., Sawsan M. A., Lila D. M. (2015). Comparison between local and imported commercial concentrates on the Performance of broiler chicks, Sudanese Journal of Agricultural Sciences (2015) 2,16-21.

4- Ahmad M. 11., Allah M. Y., Ali M. A and Hossain **M.** A. (2006). Effect of Different Protein Concentrates Replacement of Fish Meal on the Performance of Broiler, International Journal of Poultry Science 5 (10): 959-963, 2006.

5- Omer M. A. (2001),Replacement of Super-Concentrate by L-lysine and DLmethionine at Different Levels in Broiler Rations. MSc.Thesis, Sudan University of Science and Technology, Sudan, 2001.

6- Mukhtar A. M. and Mohamed H. T. (2014). Comparative study of local concentrate with import concentrate inclusion in broiler chicks diets, International Journal of Pharmaceutical Research & Analysis, Vol 4 / Issue 2 / 2014 / 80-82

7- Alam M. J., HoliderM. A. R., Pramanik NI. A. H. and Hague M. A. (2003).Effect of exogenous enzymes in diet on broiler performance. Int. J. Poult. Sci., 2: 68-173.

8- Dei H. K. (2011), Soybean as a Feed Ingredient for Live'stock and Poultry, Recent Trends for Enhancing the Diversity and Quality of Soybean Products, Prof. Dora Krezhova (Ed.), ISBN: 978-953-307-533-4, InTech.

9- Solangi A. A., Memon A., Qureshi T. A., Leghari H. H., Baloch G. M. and Wigan M. P. (2002), Replacement of fishmeal by soybeen meal in broiler ration. J. Anim. Vet. Adv., 1: 28-30

10- Jaffer M. J. (2010), Effect of Using Local Fishmeal (Liza abu) as Protein Concentration in Broiler Diets, International Journal of Poultry Science 9 (12): 1097-1099, 2010.

11- AOAC (1990). Officinal Method of Analysis Association of Officinal Analytical Chemists Pp: 66-88 .15 th. Edition Washington , D.C. USA.

12- Steel, R. G. D., and J. H. Terrie. (1997). Principles and Procedures of Statistics. A Biometric Approach. 2nd ed. Mc Graw -Hill, NewYork,NY.

13- Amasaib, E. O, Zahra, M. Soliman and Badawi, B. Y (2022). Comparative Study Between local and Imported Concentrates on the Performance of Broiler chicks. International Journal of Development Research Vol. 12, Issue, 12, pp. 60801-60805

14- Khalid, S. A. and Elhag, M. (2015) Comparison between local and imported commercial concentrates on the performance of broiler chicks. Sudanese Journal of Agricultural Sciences (2015) 2, 16– 21

15- Al-Mhsenawi, Z., Alasadi, M. and Al khfaji, Q. (2012) Effect of Different Levels of Local Concentrated Protein Manufactured from Slaughterhouse Wastes on some Carcasses Traits of Broiler. Basrah J. Agric. Sci., 34(1): 60-66

16- Shahid R., Talat N. P., Abu Saeed H., Muhammad W. S. and Kira M.(2015), Effect of Different Levels and Sources of Fish Meal on the Performance of Broiler Chicks, International Journal of Scientific & Engineering Research, Volume 6, Issue 7, July-2015.

17- Frempong, Nana S Thomas N. N. Nortey, Chad Paulk and Charles R. Stark (2019) Evaluating the Effect of replacing fish meal in broiler diets with either Soybean meal or poultry by-product Meal on Broiler Performance and total feed cost per kilogram of gain. J. Appl. Poult. Res. 28:912–918

18- Dousa, B.M., A. Abdel Ati, A and Elawad, S. M. (2011) Inclusion of Some Raw Legume Grains as Broiler Chicks Concentrates International Journal of Poultry Science 10 (5): 393-396

19- Sahraei, M., Lootfollahian, H., & Ghanbari, A. (2012). Effect of poultry by product meal on performance parameters, serum Uric acid concentration and carcass characteristics. Iranian Journal of Applied Animal Science, 2, 73-77. Wastes on some Carcasses Traits of Broiler. Basrah J. Agric. Sci., 34(1): 60-66

20- Ahmed, S. and Islam M. A. (2018) Effect of Graded Levels of Slaughter House Residues on Growth Performance and Haematological Parameters in Broiler Chicken's Ration. Asian Research Journal of Agriculture. ARJA, 9(1): 1-8