UNDER PEER REVIEW

Original Research Article

Effect of Pumpkin (*Cucurbita pepo L)* Seed Meal on the Performance and Carcass Characteristics of Broiler Chickens

ABSTRACTS

A study was conducted to evaluate the effects of feeding varying levels of pumpkin seed meal (PSM) on the growth performance and carcass characteristics of broiler chickens. Five broiler chicken (starter and finisher) diets were formulated such that diet T1 (control) contained 0.0% pumpkin seed meal (PSM) while diets T2, T3, T4 and T5 contained 5.0%, 10.0%, 15.00% and 20.0% PSM respectively replacing soybean meal. Each diet was fed to a group of 40 broiler chicken at starter and finisher phases respectively in a completely randomized design. Each group designated as treatment was further sub-divided into four replicates of 10 birds each. The result of growth performance showed that, final body weight, total weight body gain, average daily weight gain were significant differences among dietary treatments (P<0.05) as the levels of PSM increased in the diets. While total feed intake and feed conversion ratio did not differ significantly among dietary treatments. There was significant differences (P<0.05) among dietary treatments for live weight, dressed weight. Dressed weight and breast weight varied from 1000.85g in T2 (5%) to 1530.12g in T1 (0%) and 353.35g in T1 (0%) to 378.69g in T5 (20%). Dressing percent ranged from 73.07% - 78.88%. While abdominal fat, kidney, gizzard, liver and lungs weights ranged from 14.52 – 17.02, 7.88 – 8.77, 46.30 – 47.86, 16.95 – 18.09 and 6.47 to 6.93 respectively. It was concluded from the study that pumpkin seed meal is a good source of crude protein and can substitute soybean meal in a broiler chicken diet up to 20.00% since the study did not record any adverse effect of pumpkin seed meal on all the parameters studied.

Key words: Broilers, Pumpkin seed meal, Performance, Carcass characteristics.

1. INTRODUCTION

The use of conventional feedstuffs such as soybean seeds in poultry feed formulation has become very prominent because of its high crude protein content ranging from 44-47% [1]. In broiler diets, about 20-37% of Soybean is used as a source of protein [2]. High demand for soybean seeds for animal feed formulation and for human consumption has increased the cost of livestock production most especially poultry production in developing countries thereby making poultry products expensive. There is need

UNDER PEER REVIEW

therefore, to search for other readily available alternatives protein source in order to protect poultry industry in the country.

Pumpkin *Cucurbita pepo) seed* is one the alternatives that has the potential to serve as protein source in the poultry industry because of its high crude protein content. [3] reported that pumpkin seed contains 30.60 % crude protein, 4.5% Ash, 34.5 % ether extract and crude fiber (16.24 %). In Nigeria, pumpkin is cultivated with no commercial important. The plant plays an important role in the traditional setting as a cover crop and weed control agent. It is however, grown among Nigerian tribes as a vegetable crop mainly for its leaves, fruits and seed and consumed either by boiling the leaves and the fruits or roasting or baking the seeds [4]. It is known among some Nigerian ethnic groups as '*Kabewa*' in Hausa language and '*Elegede*' in Yoruba language. [3] reported 10% inclusion of pumpkin seed in a broiler diets gave similar treatment effect as that of the control. However the use of Pumpkin seed meal beyond 10% inclusion in broiler diets is lacking. Therefore, the study was design to evaluate the growth performance, carcass characteristics of broiler chickens fed varying levels (5 – 20%) of pumpkin seed meal.

2. MATERIALS AND METHODS

2.1 Study site

The study was conducted at the Poultry Research Unit of the Department of Animal Science and Range Management, Modibbo Adama University of Technology Yola, Adamawa State. The study area lies between Latitude 7° and 11' North of the Equator and Longitude 11° 14' East of the Greenwich Meridian. Dry season lasts for a minimum of five months (November-March) while the wet season starts from April to October. It has average annual rainfall of about 700mm – 1600mm and relative humidity that ranges from 5 to 42% and average maximum temperature of 39^{0}C [5].

2.2 Experimental diets, experimental design and management

The diets were formulated using pumpkin seed meal at 0%, 5%, 10%, 15% and 20% levels of inclusion designated as T1, T2, T3, T4 and T5 respectively as shown in (Tables1). Two hundred (200) day old *Anak 2000* broiler chicks procured from Agric.TeD along May-Belwa road Adamawa State Nigeria. The chicks were brooded for one week on commercial starter diet then randomly allocated to five dietary treatments of four replicate with ten birds per replicate in completely randomised designed. The birds were managed on a deep litter system throughout the experimental period which lasted for 56 days.

2.3 Data collection

Experimental birds were weighed at the beginning of the study to obtain their initial body weights and then weekly, thereafter. Daily feed intake was determined by subtracting the weight of feed left over feed from the weight of the feed offered.

UNDER PEER REVIEW

2.4 Carcass evaluation

At the end of the study, twelve birds were randomly selected from each treatment (three per replicate) for carcass and internal organ weights evaluation. The birds were starved of feed overnight to reduce the gut content. The birds were sacrificed plucked, eviscerated and internal organs removed and weighed. Dressing percent of the bird was determined thus: Dressing % = $\frac{\text{Dressed weight}}{live\ weight} \times 100$

2.5 Chemical analysis

Proximate analysis the experimental diets and pumpkin seed meal were analyzed for dry matter, crude protein, crude fibre, ether extracts, ash, oxalate, phytate and hydrocyanic acid as described by [6]

2.6 Statistical analysis

Data were subjected to one way analysis of variance (ANOVA) in a completely randomized design (CRD) according [7] using SPSS version 20. Treatment means were separated using Duncan's multiple range test (DMRT) option the same software

Table 1 Ingredient composition of broiler chicken diets

	Starter diets					Finisher diets				
ingredients	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
Maize	54.00	54.00	54.00	54.00	54.00	49.00	49.00	49.00	49.00	49.00
Soybean cake	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
PSM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wheat bran	20.00	20.00	20.00	20.00	20.00	24.00	24.00	24.00	24.00	24.00
Fishmeal	2.75	2.75	2.75	2.75	2.75	3.75	3.75	3.75	3.75	3.75
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Premix*	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Limestone	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

* 0.25kg of Mineral/ Vitamin Premix manufactured by Animal care LTD provided the following: Vitamin A 1,800IU, Vitamin D 250IU, Vitamin E 8,000IU,Vitamin K 750mg, B1 750mg, B_2 1000 mg, B_6 800mg, B_{12} 25mg Folic 300mg, Niacin 5000mg, Pantothenate 3000mg, Biotin 25mg, Choline 160g, Thyroxine 300mg, Copper 0.4g, Iron 4g, Manganese 5.5g, Iodine 0.2g, Zinc 5g, Cobalt 0.15g, Selenium 0.15g.

3. RESULTS AND DISCUSSION

3.1 Proximate composition of experimental diets

The proximate composition of the experimental diets (starter and finisher) is presented in Table 2. The crude protein (CP) of the starter diets ranged from 22.14% in T1 to 22.15% in T4. These values are within

UNDER PEER REVIEW

the recommended values of 22 -24% and 20-23 % reported by [8; 9] for broiler starter. The finisher diets recorded crude protein ranging from 19.16% in T1 to 19.20% in T3 and T5. These values are within the range 19.67 – 20.36 % reported by [10; 11; and 12]. Crude fibre content of both starter and finisher diets varied from 5.12 – 6.51%. This result did not agreed with the opinion of [8] that it is necessary to maintain fibre level of 3.5 – 5% in a broiler diet. The fibre contents of both the starter and the finisher diets are higher than the value of 2.70% recommended by [8]. Ether extracts for both starter (6.03 – 6.75%) and finisher 6.32 – 6.55%) diets were however higher than value recommended by [13] for broiler chickens

Table 3 Proximate Composition of Experimental diets

	Starter diets					Finisher diets				
Parameters	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5
Dry matter	90.23	90.16	90.34	90.89	91.21	89.92	89.86	89.76	89.78	89.79
Crude protein	22.13	22.14	22.14	22.15	22.13	19.16	19.18	19.20	19.19	19.20
Crude fibre	5.12	6.21	6.37	6.32	6.33	6.28	6.41	6.42	6.48	6.51
Ether extracts	6.21	6.18	6.10	6.12	6.15	6.19	6.08	6.10	6.09	6.12
Ash	6.75	6.03	6.10	6.13	6.14	6.55	6.35	6.32	6.33	6.34
NFE	60.39	59.34	59.29	59.28	59.25	61.82	61.98	61.96	61.91	61.83
*ME Kcal/Kg	2750	2660	2580	2510	2460	2990	2890	2710	2660	2600

Metabolizable Energy = ME (kcal/kg) = 37 x % CP + 81 x % EE + 35.5 x % NFE. Calculated according to the formula of [14].

3.2 Proximate composition of pumpkin seed meal (PLM)

The result of the proximate composition of pumpkin seed meal (PSM) is shown in Table 3. PLM had crude protein (CP) content of 28.53%, crude fibre (CF) was 21.58%, while ether extracts (EE) and ash contents were 37.18 and 6.71% respectively. The CP content of PSM recorded in this study was lower than 29.81% reported b [15] 30.60% by [3], 32.86% by [16] but higher 27.48% reported by [17]. However, the CP content is within the range of 25 – 35% reported by [18], 28 – 40.49% by [19], similar to 29.81% reported by [15]. The ether extracts (EE) was lower than of 73.59% reported by [19], 45.67% by [15] and 43.46% by [16].The concentration of oxalate (0.021mg/100g) recorded in this study is similar to 0.023mg/100g reported by [17]. High oxalate concentration in a diet increases the risk of renal calcium absorption [20]. The level of oxalate in the seed meal is not high to pose any health threat to the animals. The phytate content (34.17mg/100) of the seed meal is lower than that of *Danniellea oliveri* kernel seed 51.05 mg/100g [21]. Phytate have been reported to bind some essential mineral nutrients in the digestive tract and can result in mineral deficiencies [22]. Variations in the nutrient composition could be as a result of climatic condition, geographical location and methods of processing employed. These results conclusively confirmed the dependency of nutritional content of these seeds to regional climates [16]

UNDER PEER REVIEW

Table 3 Chemical Composition of Pumpkin (*Cucurbita pepo L)* Seed meal

Parameters	% composition
Dry matter	94.48
Crude protein	28.53
Crude fibre	21.58
Ether extracts	37.18
Ash	6.71
Nitrogen Free Extracts	26.00
Cyanide	0.27mg/100g
Phytate	34.17mg/100g
Oxalate	0.02mg/100g

3.3 Performance of broiler chicken of broiler chicken fed Pumpkin Seed meal

The result of the performance of broiler chicken fed pumpkin seed meal is presented in Table 4. The result revealed that final weight, total weight gain and average daily weight gain were significantly ($p<0.05$) affected by dietary inclusion of pumpkin seed meal. Final body weight and total feed intake ranged from 1321.50 to 1584.25g and 3287.28 to 3477.26g respectively. Increase in final body weight and total weight gain as the level of PSM increases in the diets could be attributed to balance in nutrient composition and proper metabolism associated with the seed meal. [23] opined that imbalance in nutrient composition and improper metabolism of diets are some of the factors affecting muscle development and growth among in animals. Feed intake was not ($P>0.05$) influenced by dietary inclusion of PSM in diets. This result disagreed with the finding of [3] who reported that there was significant ($p>0.05$) increased in feed intake a when broiler chickens were fed with I and 10% pumpkin seed meal. Feed conversion ratio did not differ significantly ($p>0.05$) among the treatment groups. The values recorded are within the range of 2.1 -5.1 reported by [24] for broiler under tropical environment. Better feed conversion ratio observed suggest that the birds digestion, absorption and utilized the nutrients in the diets.

UNDER PEER REVIEW

Table 4 Performance of broiler chicken fed Pumpkin Seed meal.

	Inclusion levels of pumpkin seed meal					
Parameters	T1 (0%)	T2 (5%)	T3 (10%)	T4 (15%)	T5 (20%)	SEM
Initial weight (g)	151.00	151.00	151.25	151.25	150.25	0.75^{ns}
Final body weight	1584.25^{a}	1321.50^{c}	1455.50^{b}	1572.75^{a}	1576.25^{a}	10.50^{*}
Total weight gain (g)	1433.25^{a}	1170.50^{c}	1304.25^{b}	1421.50^{a}	1425.00^{a}	9.50*
Total feed intake (g)	3477.26	3287.28	3310.36	3457.49	3469.91	14.70^{ns}
Average daily feed intake(g)	62.07	58.70	59.11	61.74	61.96	0.60^{ns}
Average daily weight gain (g)	25.59^{a}	20.90^{c}	23.29^{b}	25.38^{a}	25.44^{a}	0.20^{*}
Feed conversion ratio	2.42	2.80	2.53	2.43	2.43	0.02^{ns}

Means on the same row with different subscripts are significantly different (p>0.05) *

1.4 Carcass yield and internal organ characteristics of broiler chicken fed Pumpkin Seed meal.

Table 5 shows the result of carcass and internal organ characteristics. There was significant differences (P<0.05) among dietary treatments for live weight, dressed weight, dressing percent while breast weights, thigh, kidney, gizzard, liver and lungs weight did not differ significantly (p>0.05). Dressed weight and breast weight varied from 1000.85g in T2 (5%) to 1530.12g in T1 (0%) and 353.35g in T1 (0%) to 378.69g in T5 (20%). Dressing percent ranged from 73.07% - 78.88%. While abdominal fat, kidney, gizzard, liver and lungs weights ranged from 14.52 – 17.02, 7.88 – 8.77, 46.30 – 47.86, 16.95 – 18.09 and 6.47 to 6.93 respectively. The dressing percent recorded in this study is similar to the values 73.15 – 89.49% obtained by [25; 26] for broiler chicken in the tropics. These results showed that nutrition exert several influence on the development of carcass traits, organs and muscular growth in broiler. The result of internal weight organs similar across the dietary treatments. It is evident that increasing levels of PLM in the diet did not affect the internal organs.[27 and 28] reported that liver and kidney are the major organs of detoxification abnormalities will arise because of increased metabolic rate of the organs in an attempt to reduce the toxic elements or to convert the anti -nutritional agents to non-toxic metabolites.

UNDER PEER REVIEW

Table 5. Carcass and internal organ weight of broiler chicken fed Pumpkin Seed meal

	Inclusion levels of pumpkin seed meal					
Parameters	T1 (0%)	T2 (5%)	T3 (10%)	T4 (15%)	T5 (20%)	SEM
Live weight (g)	1530.12[a]	1290.00[c]	1401.90[b]	1511.45[a]	1522.25[a]	10.67[ns]
Dressed weight (g)	1118.16[b]	1000.85[c]	1105.93[b]	1135.93[a]	1130.99[a]	9.01*
Dressing percent	73.07	77.58	78.88	75.15	74.29	3.77[ns]
Breast weight (g)	353.35	358.46	362.86	369.96	378.69	3.87[ns]
Thigh weight (g)	168.97	170.23	154.94	163.44	170.24	8.63[ns]
Abdominal fats	14.52	14.78	15.42	17.02	15.34	1.31[ns]
Kidney	8.45	8.26	8.42	8.77	7.88	0.49[ns]
Gizzard	47.73	46.30	48.56	47.22	47.86	0.78[ns]
Liver	18.09	17.10	16.95	17.61	17.26	1.31[ns]
Lungs	6.60	6.47	6.62	6.68	6.93	0.28[ns]

Means on the same row with different subscripts are significantly different ($p>0.05$) *

Conclusion

This study clearly shown that pumpkin seed meal is a good source of crude protein substitute for soybean meal in broiler chicken. The study however did not record any adverse effect of pumpkin seed meal on all the parameters studied. Therefore, Pumpkin seed meal can be added in the diets of broiler chicken diets up to 20.00%

References

[1] Opara AU and Okorie, KC. Effect of Cooked *Mucuna sloanei* Seed Meal on the Performance, Carcass Characteristics and Apparent nutrient Digestibility on broiler finisher birds. Inter J Agri Biosci, 2015 4(4): 145- Incorporated. Tokyo Japan pp633 149.www.ijagbio.com

[2] Wafar, RJ; Ademu, L.A; Kirfi, YA ; Shehu, II (2015). Effect of Processing Methods on the Utilization of Mucuna Sloanei (Horse Eye Bean) Seed Meal by Broiler Chicken. British Journal of Applied Research 1(1), 0010-0014.

[3] Martínez, Y; Valdivié, M; Martínez, O; Estarrón, M and Córdova, J. Utilization of pumpkin (Cucurbita moschata) seed in broiler chicken diets. Cuban Journal of Agricultural Science, 2010 Volume 44, Number 4, Pp387 – 392.

[4] Facciola, S. Comucopia. A source book of edible plant, Kamping publication, Califonia USA, 1990.Pp677

[5] Adebayo, AA. & Tukur, AL. *Adamawa State in Maps*. Paraclete Publishers. Yola. 1999. Pp 25

UNDER PEER REVIEW

[6] AOAC "*Official methods of analysis*" 14th edition, Association of Official Analytical Chemists, Washington DC. USA, 1990 Pp76-86

[7] Steel, RG. D. & Torrie, J H. Principles and procedures of statistics. 2nd edition. McGraw- Hill, 1980

[8] Olomu, JM (1995). Monogastric Animal Nutrition. Principles and Practice. A jacchem Publication PP 320

[9] Oluyemi, JA. and Roberts, FA. Poultry Production in Warm Wet Climates. Rev.ed. Spectrum Books Limited, Ibadan, Nigeria, 2000 pp. 244

[10] Firman, J.D. Nutrional Requirements of Chickens and Turkey. Department of Animal Science, University of Missouri, Extension, 1993

[11] Saskatchewan, Agriculture, Food and Rural Revitalization. 3085 Abert Street, Regina, Saskatchewan, Canada. S45 OBI, 2000.

[12] Akinmutimi, AH. Evaluation of Sword Bean (Canavalia gladiata) as an Alternative Feed Resource for Broiler Chicks. PhD Dissertation, College of Animal Science and Animal Health, Michael Okpara University of Agriculture, Umudike. 2004. 4-17, 2. 29.

[13] NRC. Nutrient Requirement of Domestic Animals, Nutrient Requirement of poultry, 9th Edition, National Academy press, Washington, D.C.1996

[14] Paunzenga, U. Feeding Parent Stock Zootecnical, International 1985 pp. 22-24.

[15] Kim, SR; Ha, TY; Song, HN; Kim, YS and Park,YK. Comparison f Gourd specie, National Institute of Food Department Korea 1997.

[16] Kwiri, R; Winini, C; Musengi, M; Mudyiwa, M ; Nyambi,C; Muredzi,P and Malunga, A. Proximate Composition of Pumpkin Gourd (Cucurbita Pepo) Seeds from Zimbabwe. International Journal of Nutrition and Food Sciences. 2014 (3) 4 pp. 279-283. doi: 10.11648/j.ijnfs.20140304.17

[17] Elinge, CM, Muhammad, A., Atiku, FA, Itodo, AU, Peni, IJ, Sanni, OM., & Mbongo, AN..Proximate, Mineral and Anti-nutrient Composition of Pumpkin (Cucurbita pepo L) Seeds Extract. International Journal of Plant Research, 2012 2(5), 146- 150

[18] Chigwe, CFB and Saka, V.W. Collection and characterization of Malawi pumpkin germplasm. Zimbabwe. Journal of Agricultural Research, 1994 32: 139-147

UNDER PEER REVIEW

[19] Loukou, AL. Macronutrient composition of three cucurbit species cultivated for seed consumption in Côte d ' Ivoire. , 6 (March), 2007. Pp.529-533

[20] Chai, W. Liebman, M. Assessment of Oxalate Absorption from Almonds and Black Beans With and Without the Use of an Extrinsic Label 2004 172: 953-957

[21] Bonjour, El., WS. Fargo and PE. Renser. Positional preference and squash bugs among cucurbits in oklahoma. Journal of Entomology Society America, 1990 83(3): 943-947.

[22] Achu, MB. "Chemical Evaluation of Protein quality and phenolic compound levels of some *Cucurbitaceae* oilseeds. Cameroon.2013 12(7), pp.735-743.

[23] Wafar, RJ and Tarimbuka, L.I (2016). Effects of Substituting Groundnut cake with water spinach (Ipomoea aquatica) Leaf meal on Performance, Carcass yield and Blood Profile of Weaner Rabbit. FUW Trends in Science and Technology Journal (FSTJ), 2016 1(1) 238-242

[24] Oluyemi, JA. and Roberts, FA. Poultry Production in Warm Wet Climates. Rev.ed. Spectrum Books Limited, Ibadan, Nigeria, 2000 pp. 244.

[25] Yakubu, B. and Alfred, B. Nutritional evaluation of Toasted White Sesame Seed Meal Sesamum indicum as a source of Methionine on Growth performance, Carcass characteristics, Heamatological and Biochemical indices of finisher broiler chickens. IOSR journal of Agriculture and Veterinary Science, 2014 7 (1) 46 -56.

[26] Ogbu, N.N., Ogbu, C.C and Okorie, A.V. Growth performance of broiler chicks fed raw and processed pigeon pea (Cajanus cajan) seed meal. Journal of Animal science Research, 2015, 5 (7): 1350 – 1356.

[27] Bone, FJ. Anatomy and Physiology of Farm Animals. 2nd Edn., Reston Publishing Comp, IncVirginia, USA,1979 pp: 560.

[28] Carew, LB., Hardy, D., Gernat, A.G and Zakrzewska, EI. Heating raw velvet beans (Mucuna pruriens) reverses some antinutritional effects on organ growth, blood chemistry and organ histology in growing chickens. Journal Tropical and Subtropical Agroecosystems, 2003 l (2-3): 267– 275

Oluyemi, JA and Robert, FA . *Poultry production in warm-wet climate.* Ibadan Nigeria: Spectrum Book Limited. 2000 24 – 49

Wafar, RJ; Ademu, L A; Kirfi, YA and Shehu. II.Effect of Processing Methods on the Utilization of *Mucuna Sloanei* (Horse Eye Bean) Seed Meal by Broiler Chicken. *British Journal of Applied Research (2015) 1(1), 0010-0014.*