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Effects of differently processed sicklepod (Senn*a obtusifolia*) seed meal based diets on growth performance of broiler chickens

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Abstract

The cost of conventional feed ingredients is always on the increase from year to year leading to an increase in the cost of animal products, especially animal protein. The competition between man and livestock for some of these feed ingredients coupled with high cost has necessitated the search for alternative, non-conventional feed ingredients that would suitably replace the conventional ones used in formulating poultry diets.The main objective of this study was to evaluate the effects of toasted, fermented, and raw sicklepod seed meal (SSM) based diets on the growth performance of broiler chickens. The seeds of sicklepod were harvested, threshed, cleaned, and processed. A total of 240-day-old (Cobb 500) broiler chickens were purchased and randomly distributed to four treatments, 60 birds each, replicated thrice, 20 birds per replicate in a completely randomized design. The results on the performance of broilers fed SSM-based diets at starter phase (2 – 4) weeks show no significant (P>0.05) difference for daily feed intake (DFI), daily weight gain (DWG), and feed conversion ratio (FCR). The results at finisher phase (5 – 8) weeks) show a highly significant (P<0.01) difference for DFI, DWG, and FCR. The results on the performance at overall phase 2 – 8 weeks shows a highly significant (P<0.01 difference for DWG while DFI and FCR are significantly (P<0.05)different but mortality was not significant at all the phases. The results indicated that there was high feed utilization and an increase in daily weight gain of the broilers fed the processed SSM but birds fed diets containing fermented SSM recorded the best. Therefore, it is concluded that livestock farmers should use 10.0 % fermented SSM to feed broiler chickens as a protein ingredient, while the absence of mortality observed among the birds, proves safety in feeding broilers with SSM. Further research should be carried out on other monogastric animals using SSM.

Keywords:S*icklepod*, roasted, fermented, raw, broiler chickens

Effets de la pavée panetonie traitée différente (Senna Obttusifolia) des régimes à base de repas de semences sur Performance de la croissance des poulets à griller

Résumé

Le coût des ingrédients des aliments conventionnels est toujours sur l'augmentation d'une année à l'autre, entraînant une augmentation du coût des produits d'origine animale, notamment des protéines animales. La concurrence entre l'homme et le bétail pour certains de ces ingrédients d'alimentation associée à des coûts élevés a nécessité la recherche d'ingrédients d'alimentation alternatifs non conventionnels qui remplaceraient convenablement les celles conventionnelles utilisées dans la formulation de régimes de volaille. L'objectif principal de cette étude était d'évaluer Les effets des régimes alimentaires grillés, fermentés et bruts d'alimentaire de graines de la faucade (AGF) sur la performance de la croissance des poulets de gril. Les graines de la pavée panacée ont été récoltées, battues, nettoyées et traitées. Un total de poules à griller de 240 jours (Cobb 500) ont été

achetés et distribués au hasard à quatre traitements, 60 oiseaux chacun, ont reproduit trois fois, 20 oiseaux par réplication dans une conception complètement randomisée. Les résultats sur la performance des griller nourris au régime alimentaire SSM à la phase de démarrage (2 à 4) semaines ne montrent aucune différence significative (p> 0,05) pour la consommation quotidienne d'alimentation (CQA), le gain de poids quotidien (GPQ) et le ratio de conversion d'alimentation (RCA). Les résultats de la phase de finition (5 à 8) semaines) montrent une différence très significative (p <0,01) pour CQA, GPQ et RCA. Les résultats sur la performance de la phase globale 2 à 8 semaines indiquent une différence très significative (p <0,01) pour GPQ tandis que CQA et RCA sont de manière significative (p <0,05) différente mais la mortalité n'était pas significative à toutes les phases. Les résultats ont indiqué qu'il existait une utilisation élevée des aliments et une augmentation du gain de poids quotidien des poulets de chair nourris le AGF transformé, mais des régimes alimentés par les oiseaux contenant des AGF fermentés ont enregistré le meilleur. Par conséquent, il est conclu que les élevages d'élevage devraient utiliser un AGF fermenté de 10,0% pour alimenter des poulets de poulets à griller comme ingrédient de protéines, tandis que l'absence de mortalité observée entre les oiseaux, prouve une sécurité dans l'alimentation des poulets de chair avec AGF. Des recherches supplémentaires doivent être effectuées sur d'autres animaux monogastriques utilisant AGF.

Mots-clés: poupée de la faucade, rôtie, fermentée, crue, poulets à griller

Introduction

The escalating cost of feeds is the major problem responsible for the slow growth rate of the Nigerian poultry industry. This is as a result of the scarcity and high cost of conventional protein sources such as Soybean (*Glycine max*) and groundnut cake (*Arachiis hypogea*) Ukachukwu, 2015. Therefore, exploring for a less expensive protein feed source is extremely necessary. Sicklepod seed is one such alternative that has been neglected in feeding poultry. The proximate composition of the sicklepod seed as reported by Ingweye*et al.* (2010) has a protein content of 29.54 %, which suggests that it may be a good feed source for poultry but the seed contains some anti-nutritional factors such as tannins and alkaloids which can have effects on the digestibility and utilization of nutrients (Augustine *et al*., 2018). Therefore, it's necessary to judge the most effective processing method(s) that will enhance the use of the sicklepod seed without harmful effects. Information on processing method(s) which will optimally improve the use of sicklepod seed is scanty and therefore, it's a necessity to bridge such gap. Therefore, this study seeks to evaluate the effects of diets containing toasted, fermented, and raw *sicklepod*seed meal on the growth performance of broiler chickens.

Materials andmethods

Description of study area

This research was carried out at the Department of Agricultural Education, Farm Research Unit, School of Vocational Education, Federal College of Education (Tech), Gombe, in the Northern Guinea savannah region of the North-Eastern geographical zone of Nigeria. Its geographical coordinates range between latitudes 10° 14' 30" N and 10° 19' 30"N and longitudes 11° 7' 0" E and 11° 13' 30" E with an average temperature of 26^0C (Satellite Images of Gombe, 2005).

Research design

The design used for this experiment is a Completely Randomized Design (CRD)

Experimental birds

A total number of 240, one day-old broiler (COBB 500) chickens were purchased from the Olam farm Chikun hatchery unit. The

chicks were brooded for two weeks, and feds with Chikun broiler starter mash under proper care and good hygienic management. Thereafter, the birds were randomly allotted to four dietary treatments, 60 chicks per treatment with three replicates of 20 birds each. The birds were reared for a period of 56 days.

Collection and processing of sickle pod seeds

The sicklepod seeds were obtained from the remote outskirts of Gombe. Samples were prepared according to the method described by Shlini and Siddalinga (2015).The *sicklepods* were harvested and threshed mechanically with a mortar and pestle and then winnowed thoroughly to remove seed pods and bad ones. The raw seeds were finely milled with an electric grinding machine as required, while some portions of the cleaned seeds were toasted using a frying pan then milled, and the other portion was washed and soaked in water for 14 hours. Then the soaked seeds were fermented for 72 hours by placing them in an airtight container, then air-dried and oven-dried at 60℃ in a paper bag for 24 hours followed by cooling. The dried seeds were pulverized using a laboratory blender and sieved using a 0.5 mm mesh sieve. The flour was stored in air-tight containers before being utilized.

Experimental diets

The experimental diets are broiler starter (23 % CP) and finisher (19 % CP). The percentage composition of the experimental diets for starter (2 – 4 weeks) and finisher (5 – 8 weeks) phases are presented in Table 1.

Table 1: Dietary Compositions (%) of Broiler Starter (2 – 4 weeks) and Finisher (5 – 8 weeks) Diets

Feed Ingredients	Starter Diets				Finisher Diets			
	Processing methods				Processing methods			
	RSSM	**TSSM**	**SFD**	**FSSM**	**RSSM**	**TSSM**	**SFD**	**FSSM**
Maize	44.71	44.71	49.76	44.71	54.77	54.77	59.83	54.77
Soybean	24.44	24.44	29.39	24.44	14.38	14.38	19.32	14.38
Senna Obtusifolia	10.00	10.00	0.00	10.00	10.00	10.00	0.00	10.00
Groundnut cake	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Fish meal	7.00	7.00	7.00	7.00	5.00	5.00	5.00	5.00
Rice bran	5.00	5.00	5.00	5.00	7.00	7.00	7.00	7.00
Bone meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Premix	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
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
CP (%)	23%	23%	23%	23%	19	19	19	19

RSSM = Raw sicklepod Seed Meal, TSSM = Toasted sicklepod Seed Meal
SFD = Sicklepod Free Diet, FSSM = Fermented sicklepod Seed Meal CP = Crude Protein

Data Analysis: Data were collected on daily feed intake, daily weight gain, feed conversion ratio, and mortality. All thedata collected were analyzed using Analysis of Variance (ANOVA) of the Completely Randomized Design (CRD) using Statistix 9.0 (Statistix (2003), and where differences exist among the treatment means Least Significance Difference (LSD) was used to separate the means

Results and discussion

The results of daily feed intake, weight gain, feed conversion ratio, and mortality of broilers fed with *sickle-pod* seed diets at the starter phase arepresented in Table 2. The

results revealed that there is no significant (P > 0.05) difference among the dietary treatment means. Table 3 shows the results for the performance of broilers fed *sickle-pod*seed-based diets at the finisher phase. The result revealed that there is a highly significant difference (P<0.01) in daily feed intake (DFI), daily weight gain (DWG), and feed conversion ratio (FCR), but no significant (P>0.05) difference in mortality rate among the treatment means. The performance of broilers fed with *sickle-pod* seed diets at the overall phase was presented in Table 4. The results revealed a highly significant (P < 0.01) difference in DWG, a significant difference (P<0.05) in DFI and FCR, but no significant (P >0.05) difference in mortality rate among the treatment means.

Discussion

The performance of broilers fed with *sickle-pod* seed diets at the starter phase (2 – 4 weeks) showed that the diets were all similar and do not pose any threats to the birds. It, therefore, attests that *sickle-pod* seed diets can be fed to broiler chickens at the starter phase without any detrimental effects on growth performance. The results at finisher and overall phases showed that birds fed fermented *sickle-pod* based diet had the highest weight gain and feed efficiency compared to the birds fed other dietary treatments including the *sickle-pod* seed-free diet (control). This may be as a result of its better feed utilization and low level of anti-nutritional factors (120.17mg, 83.26mg, 104.24mg, 105.83mg, and 57.43mg/100g for tannins, phytates, alkaloids, saponins, and oxalates respectively), indicating that the fermentation method of processing sickle-pod is very effective in improving the growth performance of broiler chickens. This agrees with the findings of Augustine *et al.* (2017) who stated that cooking and fermentation improved nutrient quality and reduced anti-nutritional factors in *sickle-pod* seed. Ari *et al* (2012) also pointed out that the inclusion of fermented feeds in poultry diets improves nutrient digestibility and growth performance.

Table 2: Performance of broilers fed sickle-pod seed-based diets at starter phase (2 – 4 Weeks)

	Processing Methods				
Parameters	**RSSM**	**TSSM**	**SFD**	**FSSM**	**SEM**
DFI (g)	34.79	34.76	37.08	37.52	0.72^{NS}
DWG (g)	10.71	12.26	15.59	16.67	0.36^{NS}
FCR	3.50	2.83	2.42	2.53	0.39^{NS}
Mortality (No)	0.00	0.00	0.00	0.00	0.00^{NS}

NS = Not Significant

Table 3: Performance of broilers fed sickle-podseed based diets at Finisher Phase (5 – 8 Weeks)

	Processing Methods				
Parameters	**RSSM**	**TSSM**	**SFD**	**FSSM**	**SEM**
DFI (g)	57.36^{b}	57.81^{b}	69.14^{a}	57.26^{b}	0.00**
DWG (g)	19.36^{b}	27.29^{a}	28.72^{a}	31.90^{a}	0.00**
FCR	2.99^{a}	2.12^{bc}	2.42^{b}	1.80^{c}	0.00**
Mortality (No)	0.00	0.00	0.00	0.00	0.00^{NS}

^{abc} Means bearing different superscripts within the same row differ significantly

Table 4: Performance of broilers fed sickle-pod seed-based diets at overall phase (2 – 8 Weeks)

Parameters	Processing Methods				SEM
	RSSM	TSSM	SFD	FSSM	
DFI (g)	46.08[b]	46.29[b]	53.11[a]	47.39[b]	0.03*
DWG (g)	15.04[c]	19.78[b]	22.16[ab]	24.28[a]	0.01**
FCR	3.14[a]	2.34[b]	2.41[b]	1.97[b]	0.02*
Mortality (No)	0.00	0.00	0.00	0.00	0.00[NS]

[abc] Means bearing different superscripts within the same row differ significantly (P<0.05)
NS = Not significant * = (P< 0.05), ** = (P< 0.01), *** = (P< 0.001), DFI = Daily Feed Intake, DWG = Daily Weight Gain, FCR = Feed Conversion Ratio, **RSSM** = Raw Sicklepod Based Diet, **TSSM** = Toasted Sicklepod Based Diet, **SFD** = Sicklepod Free Diet, **FSSM** = Fermented Sicklepod Based Diet **SEM** = Standard Error of Mean

Feed conversion ratio (1.97) was better in birds fed fermented *sicklepod* seed meal compared to the other treatment groups. This could be attributed to the marked reduction of the anti-nutritional factors in the fermented SSM included in the diet as earlier reported by (Augustine *et al*., 2017). The result was also in agreement with the findings of Augustine *et al* (2016) who found that fermentation was most efficient in reducing the Anti-nutritional Factor levels and improving the protein content of the *sicklepod* seed.The poor weight gain and feed utilization results of the birds fed diets containing raw *sicklepod* seed indicates that high levels of anti-nutritional factors in raw seeds impedes nutrient utilization (378.50mg, 247.20mg, 248.60mg,190mg, and 102mg/100g for tannins, phytates, Alkaloids, saponins, and oxalates respectively). This agrees with Augustine *et al* (2018) who reported depressed weight gain, feed conversion ratio and nutrient digestibility in broiler chickens fed diets containing 50g raw *Senna tora*seed meal/kg diet.

Conclusion

It can be concluded that broiler chickens fed diets with 10 % level of inclusion of processed *sickle-pod* seed meal recorded higher growth performance, especially the diet containing fermented seed compared to birds fed the control diet and other processing methods. In addition, it was safe to feed SSM-based diets to broilers without any adverse effects on growth performance. Based on the findings of this study, it is recommended that Poultry farmers can use 10% fermented*sicklepod* seed in diets of broiler chickens *for better weight gain.*

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