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EFFECTS OF DIFFERENTLY PROCESSED SICKLEPOD (*SENNA OBTUSIFOLIA*) SEED MEAL BASED DIETS ON GROWTH PERFORMANCE OF BROILER CHICKENS

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ABSTRACT

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 (CRD). The results on the performance of broilers fed SSM based diets at starter phase (2 – 4) weeks show no significant difference (P>0.05) 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 difference (P<0.01) for DFI, DWG, and FCR. The results on the performance at overall phase 2 – 8 weeks shows a highly significant difference (P<0.01) for DWG while DFI and FCR are significantly different at (P<0.05) but mortality was not significant at all the phases. The results indicated that there was high feed utilization and an increased in daily weight gain of the broilers fed the processed SSM but birds fed diets containing fermented SSM recorded the best. Therefore, it is recommended 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: sicklepod, Roasted, Fermented, Raw, Broiler chickens

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 AND METHODS

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^{0}C (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 two hundred and forty (240) day-old broiler (COBB 500) chickens were purchased from the Olam farm Chikun hatchery unit. The chicks were brooded for two (2) 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 fifty-six (56) days.

Collection and Processing of Sicklepod 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˚C 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 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 the data collected were analysed 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 sicklepod seed diets at the starter phase were presented in Table 2. The results revealed that there is no significant difference ($P > 0.05$) among the dietary treatment means. Table 3 shows the results for the performance of broilers fed sicklepod 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 difference ($P>0.05$) in mortality rate among the treatment means. The performance of broilers fed with sicklepod seed diets at the overall phase was presented in table 4. The results revealed a highly significant difference ($P < 0.01$) in DWG, a significant difference ($P<0.05$) in DFI and FCR, but no significant difference ($P >0.05$) in mortality rate among the treatment means.

Discussion: The performance of broilers fed with sicklepod seed diets at 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 sicklepod seed diets can be fed to broiler chickens at starter phase without any detrimental effects on growth performance. The results at finisher and overall phases showed that birds fed fermented sicklepod based diet had the highest weight gain and feed efficiency compared to the birds fed other dietary treatments including the sicklepod 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 sicklepod 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 sicklepod 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 sicklepod 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 sicklepod seed 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 sicklepod seed based diets at Overall Phase (2 – 8 Weeks)

	Processing Methods				
Parameters	**RSSM**	**TSSM**	**SFD**	**FSSM**	**SEM**
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 is in agreement 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 AND RECOMMENDATIONS

It can be concluded that broiler chickens fed diets with 10 % level of inclusion of processed sicklepod 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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