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Assessment of Nutritional Potential of Some Mixed Non-Conventional Feed Resources in Aliero Lga of Kebbi State, Nigeria

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ABSTRACT

Non-conventional plant and animal origin of farm and agro industrial wastes are potential feed materials and are being exploited for livestock production in Nigeria. Thus an experiment was conducted to evaluate the nutritional potential of millet panicle husk mixed with molasses solution and different levels of poultry dung. Millet panicle husks were measured using a weighing balance and prepared in to four different samples (A, B, C and D) each weighing 100g. A solution of molasses (70cL) was prepared with water (30cL) and mixed with the samples except with sample A (control). Thereafter, dried poultry dung was mixed to each four sample of millet panicle husk at; 0%, 20%, 30% and 40% to make a ratio; 100:00, 80:20, 70:30 and 60:40 designated as treatments; A, B, C and D. Samples were replicated three times in a completely randomized design and oven dried at 65^0C for 48 hours and were taken to the laboratory for proximate, fiber fractions, minerals and phytochemical analysis. Treatment of millet panicle husk with molasses and varying levels of poultry dung improved ($p<0.05$) chemical composition of mixture. Treatment D had higher CP, ash, NCF and Na (19.25%, 11.00%, 43.65% and 20.00mg/g) respectively and lower CF (21.54%), ADF (33.20%) and ADL (9.09%) were obtained in treatment C. The phytochemical components (saponin, cyanide, tannin and phenolic) measured were also higher in treatment D (12.30%, 136.18mg/dl, 34.88mg/dl and 21.89mg/dl) respectively. Results suggested that mixture of molasses solution and poultry dung with millet panicle husk improved feeding value of millet panicle husk which may serves as ruminant feed during forage scarcity.

Keywords: Non-conventional feed resources, potential, mixture, chemical composition

INTRODUCTION

Among the constraints facing livestock production in developing countries particularly during the spell of dry season is the inadequate feed supply. Non-conventional plant and animal origin of farm and agro industrial wastes are potential feed materials and are being exploited for livestock production in Nigeria (Okonkwo *et al*., 2008).

Most non-conventional feed resources such as rice straw, groundnut husk, millet panicle husk etc. are usually regarded as wastes because of poor nutritional value and utilization by livestock. Cereal crops such as sorghum and millet are the most important crops cultivated in the study area. Millet panicle husk is generated after the harvesting of the grain millet. It is a by-product which is coarse, highly fibrous with low protein which rendered it poorly utilized by livestock (Heuze and Trans, 2013).

Various technologies have been investigated in Nigeria to improve the nutritive values of non-conventional feed resources (Amata, 2014). The most popular ones are chemical, physical, ensiling and mixing of several agro-industrial by-products in the form of hard feed blocks (Ben Salem and Nefzaoui, 2003). Recycling and reprocessing of wastes offers the possibility of returning these materials to beneficial use. Molasses which is a by-product of sugar is suitable as an excellent source of energy and minerals (Senthilkumar *et al*., 2016). The high nitrogen content in poultry dung suggests that feeding it to ruminants would be an excellent way to increase their protein intake (Lanyasunya *et al*., 2006). Molasses and urea are potential materials that can be useful supplementary sources (Chiejina *et al*., 2015) which can be used to improve the nutrients of millet panicle husk.

Substantial information is required on chemical composition and the presence of anti-nutritional components contained in the mixture of non-conventional feed resources. Therefore, this study was designed to evaluate the nutritive value of millet panicle husk treated with molasses and poultry dung as a potential ruminant feed resource.

MATERIALS AND METHODS

Experimental area

Experiment was conducted in the Animal Science Department Laboratory of Kebbi State University of Science and Technology Aliero. The area lies at Latitude 12^0: 16", 42^0N and Longitude 7^0, 6^0E of the Equator. The ambient temperature ranges from 26^0C to 42^0C with annual rainfall of about 500 – 850mm with a peak in August (KARDA, 2017).

Collection and processing of samples

Millet panicle husks were collected from local farmers at the processing point and screened off from foreign objects while poultry dung obtained from a poultry farm was oven dried at 60^0C, molasses was purchased from the market. All the samples were obtained in the study area.

Sample mixing procedure

Millet panicle husk were measured using a weighing balance and prepared in to four different samples (A, B, C, and D) each weighing 100g. A solution of molasses (70cL) was prepared with water (30cL) and mixed with the samples except with sample A (control). Thereafter, dried poultry dung was mixed to each four sample of millet panicle husk at; 0%, 20%, 30% and 40% to make a ratio; 100:00, 80:20, 70:30 and 60:40 designated as treatments; A, B, C and D. The samples were replicated three times in a Completely Randomized Design (CRD) and oven dried at 65^0C for 48 hours and taken to the laboratory for chemical analysis.

Chemical analysis of samples

About 5g of sample from each replicate was used to determine the; proximate, mineral elements and phytochemical components. Proximate constituents such as Crude protein, ether extracts (EE), Ash, Crude Fibre (CF), Acid Detergent Lignin (ADL), Neutral Detergent Fiber (NDF) and Acid Detergent Fiber (ADF) were measured according to the procedure described by AOAC (2015). Mineral elements (Sodium, Potassium and Calcium) were estimated using emission flame photometer, while Zinc and Magnesium were determined using Atomic Absorption Spectrophotometer. The quantitative phytochemical analysis of saponin, alkaloid, cyanide, tannin and phenolic were determined by the method described by (Iwuozor, 2019),

Statistical analysis

Data collected were analyzed and subjected to analysis of variance using General Linear Model (GLM) of the SPSS (2015). Duncan Multiple Range Test was used to determine the significant differences among the treatment means at 5% probability level.

RESULTS AND DISCUSSION

Results of millet panicle husk mixed with molasses and poultry dung are shown in Table 1.Treatment of millet panicle husk with molasses and varying levels of poultry dung improved ($p<0.05$) proximate composition of mixture. The values of dry matter obtained in this study were similar with findings of Mubi *et al*. (2008) when alkali treated sorghum stover was supplemented with poultry litter. Crude protein contents of treated millet panicle husk steadily increased as poultry dung inclusion increases with treatment D having highest values (19.25%). The steady increased in CP values were in line with study of Bello and Tsado (2014) when sorghum stover was supplemented with graded levels of dried poultry droppings. Addition of molasses improved the carbohydrate of millet panicle husk. Non fiber carbohydrate increased across the treatments than the control treatment. Observation in present study is in line with the findings of Senthilkumer *et al*. (2016). The lipid content was highest in treatment B (2.00%) than other treatments. The result obtained was in line with the reports of Muhammad *et al*. (2022) when rice milling waste was ensiled with urea and poultry litter. The range of the ash contents (6.50-11.00) of treated millet panicle husk in this study were similar to the findings of Rebecca *et al*. (2022) when cassava peels was treated with molasses. Loest *et al*. (2001) reported that the nutritive value of forage fermented with molasses were all improved.

Table 1: Proximate composition of millet panicle husk treated with molasses and poultry dung

	ratio of millet panicle husk and poultry dung				
Parameters (%)	TA(100:00)	TB(80:20)	TC(70:30)	TD(60:40)	SEM
DM	94.2	94.6	94.6	94	2.926
CP	5.75^{d}	8.58^{c}	17.50^{b}	19.25^{a}	0.02
CF	38.73^{a}	24.30^{b}	21.54^{c}	23.50^{b}	0.46
NFC	29.23	44.03	49.5	43.65	8.838
Ash	5.50^{c}	6.50^{c}	9.00^{b}	11.00^{a}	0.59
Lipid	1.00^{b}	2.00^{a}	1.00^{b}	1.00^{b}	0.245

a,b,c,d: means on the same row with different superscripts are significantly ($P<0.05$) different

CP: Crude Protein; CF: Crude Fiber; NFC: Non Fiber Carbohydrate; DM: Dry Matter

Table 2 presents the results of fiber fractions of treated millet panicle husk with molasses and graded levels of poultry dung. All the parameters measured were significantly ($p<0.05$) affected with exception of ADF and NDF. All the parameters measured decreased as the addition of poultry dung increases. The lowest ADF, ADL, NDF and hemicellulose (33.20%, 9.09%, 42.30% and 9.10%) respectively were obtained in treatment C while the lowest cellulose (15.11%) was recorded for treatment D. The results of ADF and ADL contents of treated millet panicle husk in this study were in line with the findings of Oderinwale *et al*. (2022) when corncobs were treated with urea at varying level. Ball *et al*. (2007) classified forage materials with ADF values greater than 43.00%-45.00% as low quality forages. Treatment C had the superior ADF content. The hemicellulose values recorded among treated millet panicle husk were similar to those reported by Lamidi *et al*. (2023) while the cellulose values were in contrast when guinea grass-cassava peel mixture with centro leaves and *Delonix regia* seed meal were ensiled.

Table 2: Fiber fractions of millet panicle husk treated with molasses and poultry dung

	ratio of millet panicle husk and poultry dung				
Parameters (%)	TA(100:00)	TB(80:20)	TC(70:30)	TD(60:40)	SEM
ADF	37.1	36.7	33.2	33.7	3.221

ADL	15.69^{a}	12.69^{b}	9.09^{d}	9.69^{c}	0.116
NDF	49.8	46.5	42.3	46.4	4.774
Cellulose	27.01^{a}	24.41^{ab}	24.11^{b}	15.11^{c}	1.201
Hemicellulose	15.70^{a}	12.70^{a}	9.10^{c}	9.70^{c}	0.815

a,b,c,d: means on the same row with different superscripts are significantly (P<0.05) different

ADL: Acid Detergent Lignin; ADF: Acid Detergent Fiber; NDF: Neutral Detergent Fiber

The mineral elements content of treated millet panicle husk were significantly (p<0.05) better than the control treatment with exception of Zn (Table 3). However treatment C had the highest (p>0.05) Zn value (2.10mg/g) than other treatments. The highest values of Na (20.00mg/g), K (240.00mg/g) and Mg (5400mg/g) were obtained in treatments A, C and C respectively while treatment B and C had the same value (1300mg/g) in their Ca contents. Calcium values obtained in this study were in line with the recommended level for cattle and sheep (Khan *et al*., 2006). Optimal Ca concentration in the diet ensures proper assimilation of fat and fibers (Machmuller and Kreuzer, 2005). The values of K recorded among treated millet panicle husk are below the critical levels (7.00-8.00g/kg) requires for adult sheep (Renne, 2001). The Mg contents of this study are above the range recommended (1.00-2.00g/kg) requirements in the diet of different classes of ruminant (Mac Dowell, 1992). The Na levels recorded obtained are higher than those reported by Muhammad *et al.* (2023) when rice milling waste was ensiled with urea and poultry litter. The low and non-significant (p>0.05) values recorded for Zn across the treatments might be due to low trace minerals content of millet panicle husk and low supplementation level with molasses and poultry dung. Although molasses (Senthilkumar *et al*., 2016) and poultry dung (Jimoh *et al*., 2019) contain significant quantities of trace minerals such as copper, zinc, iron and manganese

Table 3: Mineral composition of millet panicle husk treated with molasses and poultry dung

	ratio of millet panicle husk and poultry dung				
Parameters (mg/g)	TA(100:00)	TB(80:20)	TC(70:30)	TD(60:40)	SEM
Na	2.50^{d}	10.00^{c}	17.50^{b}	20.00^{a}	0.364
K	172.60^{c}	220.00^{b}	240.00^{a}	222.50^{b}	4.591
Ca	1000.00 ^{b}	1300.00^{a}	1300.00^{a}	1200.00^{ab}	66.207
Mg	4500.00^{b}	3500.00^{c}	5400.00^{a}	3800.00^{c}	164.703
Zn	1.7	1.68	2.1	1.56	0.329

a,b,c,d: means on the same row with different superscripts are significantly (P<0.05) different

Na: Sodium; K: Potassium; Ca: Calcium; Mg: Magnesium; Zn: Zinc

All the parameters measured for phytochemicals on the treatments were significantly (p<0.05) affected (Table 4). The values of saponin, cyanide, tannin and phenolic were higher among the treatments that the control treatment with exception of alkaloid which is statistically the same among treatments A, C and D. The highest values of saponin (12.54%), alkaloid (1.37%), cyanide (136.18mg/dl), tannin (34.88mg/dl) and phenolic (21.89mg/dl) were recorded for treatments; B, B, D, D and D respectively while the least values were obtained in treatments; A, (2.83%), D (0.70%), A (96.19mg/dl), A (24.43mg/dl) and A (16.33mg/dl) respectively. The higher values observed in most of the phytochemical components among treated millet panicle husk with molasses and poultry dung might be due to higher phytochemicals contents in sugarcane crop and its different products (Singh *et al*., 2015) and sugarcane molasses (Shafiqa-Atikah *et al*., 2020).

The higher values of phytochemicals constituents among treated millet panicle husk with molasses and poultry dung has a great potential as substitutes for classic antibiotics which has a promising effect on animal production (Rossiter *et al*., 2017; Li *et al*., 2021).

Table 4: Phytochemical analysis of millet panicle husk treated with molasses and poultry dung

	ratio of millet panicle husk and poultry dung				
Parameters	TA(100:00)	TB(80:20)	TC(70:30)	TD(60:40)	SEM
Saponin (%)	2.83^{d}	12.54^{a}	4.75^{c}	12.30^{b}	0.067
Alkaloid (%)	1.00^{b}	1.37^{a}	0.99^{b}	0.70^{b}	0.108
Cyanide (mg/dl)	96.19^{d}	108.09^{c}	122.54^{b}	136.18^{a}	0.098
Tanin (mg/dl)	24.43^{d}	26.16^{c}	31.25^{b}	34.88^{a}	0.098
Phenolic (mg/dl)	16.33^{d}	18.54^{c}	19.78^{b}	21.89^{a}	0.14

a,b,c,d: means on the same row with different superscripts are significantly ($P<0.05$) different

CONCLUSION

Mixture of millet panicle husk with molasses and graded levels of poultry dung improve its overall chemical composition which could serve as feed resources for feeding ruminant animals during feed shortage.

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