The Effect of Supplements Bunaji Weaner Cattle with Dried Poultry Manure based Concentrate Diets

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Target Audience: Animal Scientists, Farmers, Extension Staff

Abstract

Two experiments were conducted at the Livestock Teaching and Research Farm, University of Agriculture; Makurdi to evaluate the effect of dried poultry manure (DPM) based concentrate diets on the performance of Bunaji weaner cattle grazing natural pasture. In experiment 1, ten Bunaji weaner cattle aged between ten and eleven months and weighing approximately 117kg on the average, grazing natural pasture were fed DPM based concentrate diets for 90 days in a complete randomized design. The concentrate diets contained 0, 17.8, 33.7 and 47.96 percent levels of DPM and were designated treatments A, B, C, and D respectively. Animals on treatment E grazed natural pasture only. There was a decreasing trend in body weight gain as the level of DPM in the diets increased. However, no significant difference (P>0.05) were observed in feed intake, body weight gain and feed efficiency among the animals. The daily-weight gain of the animals that were supplemented with DPM based concentrate diets however was significantly (p<0.05) higher than those on natural pasture alone. The average daily weight gains for treatments A, B, C, D, and E were 0.65kg, 0.60kg, 0.48kg, 0.44kg and 0.10kg respectively.

In experiment 2, four male Bunaji weaner cattle with an average age of 13.5 months and weight of 129.5kg were used in a 4 x 4 latin square digestion trial to evaluate the utilization of the experimental diets. DM, CP, CF, EE and NFE digestibilities were not significantly different (P>0.05) among the treatments. There was however, a decreasing trend in the digestibilities of DM, CP, CF, EE and NFE as the level of DPM in diets increased. DM digestibility were 71.85, 68.53, 65.84 and 60.75 per cent for diets A, B, C and D; CP digestibilities were 80.14, 76.60, 73.91 and 71.68 per cent for diets A, B, C, and D respectively. The CF digestibilities were 56.19, 51.48, 49.02 and 45.04 percent; EE digestibilities were 87.81, 86.35, 85.50, and 85.95 percent while the NFE digestibilities were 79.26, 78.46, 77.30 and 74.61 percent for diets A, B, C, and D respectively.

The nutritional and practical significance of these results are discussed.

Keywords: Supplementation, weaner cattle, poultry manure.

Description of Problem

In Benue State like other parts of the tropics, cattle graze mainly native pastures which decline rapidly in quantity and quality with seasons. This decline is with respect to protein as well as phosphorus and magnesium during the rainy and dry seasons (1). Because cattle and other ruminants can hardly maintain their live weights solely on pasture particularly during the dry season, it has become necessary to provide supplements for them. However, protein supplements are both scarce and costly in developing countries and their future use for ruminants appears uncertain (2). The shortage of grains and agro-industrial by-products has generated interest in the use of non-conventional feedstuff such as poultry manure. DPM has been used as a component of livestock diet in which it serves as a source of nitrogen for ruminants. The feeding of poultry manure to ruminants not only supplies the necessary nutrients but also serves as an effective means of evaluation and utilization of what hitherto would have constituted an environmental problem.

The objectives of the study were to evaluate the performance of Bunaji weaner cattle supplemented with DPM based concentrates as well as determine the digestibility of DPM in the weaner cattle.

Materials and Methods

Location of the Study Area

The study was carried out at the University of Agriculture, Makurdi Livestock Teaching and Research Farm in Benue State which is located in the Middle Belt of Nigeria. Benue State is situated within the Guinea Savannah zone of West Africa at latitude 7°44'north and longitude 8°21'east. The area is characterized by about 8-9 months of rainfall and the annual rainfall is within the range of 1317 and 1323mm. The ambient temperature is highest by February and March and ranges from 36.5 to 37.0°C. The lowest mean monthly temperature of 29.9°C occurs around August.

Experimental Diet

The dried poultry manure used for this study was obtained from 11-month old caged layers at the Big Bam Farms, North Bank Makurdi. The wet poultry manure was collected and sundried on a concrete floor of an open building in the farm. The manure while drying was stirred at intervals to allow for uniform and proper drying. The drying period lasted six days. The dried poultry manure was ground in a mill to ease mixing with other ingredients. Samples of the milled DPM was tested at the Bacteriological Labouratory of the National Veterinary Research Institute (NVRI) Vom, and was certified to be free of pathogens. The milled DPM was stored in bags until needed for use. The palm kernel meal used was solvent extracted.

Four diets were formulated using palm kernel meal (PKM), dried poultry manure (DPM), maize offal, molasses, bone meal and salt. The dried poultry manure was incorporated into the diets at 0 (control), 17.8, 33.7 and 47.96 percent designated A,B,C and D respectively.

Experiment 1: Feeding Trial

Ten Bunaji weaner cattle aged between 10 and 11 months and weighing between 105 and 130kg were used. Two weaners (male and female) were used per treatment in a complete randomized design (CRD). In all, there were five treatments designed as; A,B,C,D and E with A and E as controls. Weaners on treatment A (positive control) were fed concentrate without DPM in addition to grazing natural pasture while weaners on treatment E (negative control) grazed natural pasture only. Weaners on treatments B, C and D were fed concentrate diets with 17.8, 33.7 and 47.9 percent inclusion of DPM respectively in addition to grazing natural pasture. All the weaners used were dewormed with Ivomec, treated against trypanosomiasis and vaccinated against contagious bovine pleuropneumonia (CBPP) and rinderpest. Weaners on treatments A,B,C and D were confined in the treatment pens for two weeks, (14 days) to allow them get used to diets since they were being fed on concentrate for the first time. Thereafter, they were allowed to graze and supplemented with the treatment diets for another two weeks (i.e the adjustment period). At the end of the adjustment period, the trial proper commenced. Each weaner was weighed at the beginning of the experiment and at 15 days interval till termination of the trial. The experimental diets were given in the morning (7.30a.m.) at 1.5kg per head per day. On returning from grazing, the weaners ate whatever that was left before going out in the morning. Left-overs were weighed the next day before fresh feeds were served. Water was provided *ad-libitum* throughout the period. The weaners were allowed to graze natural pastures between the hours of 09h and 14h after which they were returned and confined to their respective pens except those on treatment E that were left with the rest of the herd in their paddock since they were not supplemented.

Experiment 2: Digestion Trial

Four male Bunaji weaner cattle of average age of 13.5 months were used in a 4 x 4 latin square design to evaluate the utilization of the experimental diets A, B, C and D.

The weaners were dewormed with Levajet before the commencement of the trial and fed for ten days (i.e. the preliminary feeding period) followed by a five-day total collection period. Each weaner spent 15 days on each diet made up of first five days as change over period, next five days as adjustment period and the following five days as collection period. For the four diets, the whole trial period lasted 60 days. Each experimental diet given was weighed and recorded for the five-day period and the left-over was also weighed and recorded for the five-day period. Water was provided *ad-libitum* throughout the experimental period. Each weaner was fitted with harness and bag and allowed 3 days to get used to it in such a way that faecal contamination with urine was avoided. The faeces collected were properly dried and stored in labeled polythene bags. The total faeces collected from each treatment at the end of each period was bulked, mixed thoroughly and subsampled for proximate analysis. The actual quantity of feed consumed was determined by subtracting the left over feed from the quantity given the previous day while the actual quantity utilized was determined by subtracting the dried faeces collected from the quantity consumed.

Analyses of Samples and Data

The proximate composition of the feed and faecal samples were determined by standard method (4).

The net energy content of the feed was however calculated using the formula (5) Data collected were analysed statistically by analysis of variance (ANOVA). Treatment means were compared using the Duncan's multiple range test (6).

Results and Discussion

Proximate Composition of the Experimental Diets

The feed ingredients used in compounding the experimental diets are presented in Table 1 and showed a decreasing level of palm kernel meal inclusion from 56.60% in diet A to 0% in diet D while the inclusion rate of dried poultry manure decreased from 0% in diet A to 47.96% in diet D.

The proximate composition of the feed ingredients used in compounding the experimental diets (Table2) showed that the crude protein (CP) value (20.05%) obtained for DPM is lower than 25.2-42.0% reported by other workers (7,8,9) but is similar to 20.3% - 22.0% obtained by others (10,11) and within the reported range of 14.6 – 30.0% (12, 13). The disparity could be due to the dietary and physiological status of the birds, age of the excreta and drying temperature (14). A comparatively high crude protein level in chick waste compared to older birds was related to the incomplete digestion due to the rapid passage of feed through the shorter length of the intestinal tract (15). The EE, Ash and NFE

Table 1: Percentage Composition of Experimental Diet

Ingredient	A	B	C	D
Palm Karnel Meal	56.60	35.58	16.85	00.00
Dried Poultry Manure	00.00	17.80	33.70	47.96
Maize Offal	35.40	38.62	41.45	44.04
Molesses	05.00	05.00	05.00	05.00
Bone Meal	02.00	02.00	02.00	02.00
Salt	01.00	01.00	01.00	01.00
Total	100.00	100.00	100.00	100.00

Table 2: Proximate Composition of Dietary Ingredients (on Dry Mater Basis)

Parameter	Dried Poultry Manure	Maize Offal	Palm Kernel Meal	Molasses
Dry Matter	91.13	88.95	95.50	75.00
Crude Protein	20.05	9.50	18.44	2.50
Crude Fibre	13.00	11.75	15.50	0.00
Ether Extract	1.54	7.00	7.20	0.45
Ash	26.00	3.00	8.00	8.40
Nitrogen Free Extract	39.41	68.75	50.86	88.65
Net Energy Kcal/g	350.41	452.99	483.10	375.81

Table 3: Proximate Composition of the Experimental Diets (on Dry Matter Basis)

Parameter	A	B	C	D
Dry Matter	91.72	87.00	89.82	88.74
Crude Protein	14.24	14:45	14.50	14.70
Crude Fibre	13.50	13.00	12.20	11.95
Ether Extract	7.10	6.95	05.68	05.41
Ash	5.18	9.00	12.00	13.90
Nitrogen Free Extract	59.98	56.60	55.62	54.04
Net Energy Kcal/g	455.29	439.05	419.49	410.50

values obtained are within the range reported by some workers (15, 16) while the CF value of 13.0% is similar to 12.7% and 13.4% earlier (7,10) reported.

The CF value of maize offal (11.75%) is similar to 12% earlier reported (17) while the CP value (9.50%) is lower than values of 12.4% and 12.1% reported by two authors (17, 18). The difference could be due to the source and method of processing of the maize grain.

The palm kernel meal used was high in protein (CP 18.4%) which was however slightly lower than the reported value of 20.73% (19) while the CF and EE values were higher than the values of 14% and 2.0% respectively (19). The variation might be attributed to differences in the source, method of processing and the efficiency of oil removal by the different oil mills.

The proximate composition of the experimental diets is presented in Table 3. The CP levels of the four diets were within the recommended range (12 – 18%) for growing cattle in the tropics (20). The CF value of the treatment diets decreased with increasing levels of DPM inclusion. The control had the highest CF value while treatment D had the least. This decrease in CF value of the treatment diet with increasing levels of DPM inclusion can be attributed to the lower CF content of DPM compared to the PKM value (Table 2). The Ash content of the diets increased with increasing levels of DPM and this is probably a reflection of the high Ash content (26%) of DPM. The EE value of the diets on the other hand decreased with increasing levels of DPM inclusion in the diet. The PKM with highest EE value in the ingredient (Table 1) could be responsible for this trend. The NFE and NE also decreased as the level of DPM in the diets increased. The decrease in the NE value of diets with increasing level of DPM probably reflect, the high Ash content of DPM.

Table 4: The Effect of Dietary Treatment on Feed intake, Daily Live Weight Gain and Feed Conversion Ratio of the Weaners on the Diets and Daily Weight Gain of Weaners on Natural pasture Alone.

Parameter	A	B	C	D	E	SEM
Number of weaners	2	2	2	2	2	-
Feeding period (days)	90	90	90	90	90	-
Initial mean weight (kg)	115.25	112.25	111.25	114.0	119.00	±3.129
Final mean weight (kg)	174.00	166.75	154.75	154.0	128.0	±7.359
Gain in weight (kg)	58.75	54.25	43.50	40.00	9.0	±6.230
Average daily weight gain (kg)	0.65[a]	0.60[a]	0.48[a]	0.44[a]	0.1[b]	±0.08
Mean total feed intake (kg)	135.00	135.00	129.75	125.0	-	±4.811
Daily feed intake (kg)	3.00	3.00	2.88	2.78	-	±0.05
Feed Conversion ratio (Kg intake/Kg gain)	2.298	2.488	2.980	3.125	-	±0.20

a,b Means within a row with the same superscripts are not significantly different (P>0.05

Table 5: Nutrient Digestibility Coefficient of Experimental Diets

	Diets				
Parameter	A	B	C	D	SEM
Dry Matter (DM) (%)	71.85	68.53	65.84	60.75	±2.35
Crude Protein (%)	80.14	76.60	73.91	71.68	±1.82
Crude Fibre (%)	56.19	51.48	49.02	45.04	±2.34
Ether Extract (%)	87.81	86.35	85.50	85.95	±0.50
Nitrogen Free Extract (%)	79.26	78.46	77.30	74.61	±1.01
TDN	72.77	68.17	64.55	60.89	±2.545

Performance Data of Experimental Animals

Table 4 showed the feed intake, weight gain and feed conversion ratio of weaner cattle on the experimental diets and the weight gain of the weaners on natural pasture. Feed intake and feed conversion ratio were not significantly (P>0.05) affected by treatment. However, there was significant (P<0.05) effect of the diets on daily weight gain.

The mean liveweight gains (kg/day) for weaners on treatments A,B,C,D and E were o.65, 0.60, 0.48, 0.44 and 0.10 respectively. The highest weight gain of 0.65kg was recorded for the supplemented group on treatment A (positive control) and least for the unsupplemented group on treatment E (negative control). The result showed significant difference (P<0.05) due to supplementation. The better performance of the supplemented groups (A,B,C and D) over the unsupplemented group (E) is due to the fact that the supplement supplied more quantities of nutrients compared to that supplied by the pasture alone. This agrees with the findings (21) that supplemented heifers under tropical grazing conditions were superior to the unsupplemented heifers. Similarly, the performance of cattle grazing natural pasture in the tropics can be improved through supplementation (22). The mean liveweight gains among the supplemented groups (diets, A, B, C and D) were not significantly (P>0.05) different. However, the highest average daily gain was recorded for the positive control (Diet A) and decreased as the level of DPM inclusion in the diets increased. The non-significant difference in daily weight among the supplemented group could be due to the small number of animals used. The decreasing trend in average daily weight gain with increasing levels of DPM (above 17.8% inclusion rate) in the diet also agrees with earlier reports (8,23). Depression in the rate and efficiency of gain may be due to the lower energy of the DPM than the diet with which it was substituted. In general, the males recorded higher weight gains than their female counterparts.

Nutrient Digestibility

The mean apparent nutrient digestibility of the experimental diets is summarized in Table 5. The result showed that the mean DM, CF, EE, NFE and TDN digestibility values for diets A,B,C and D were similar. Dietary treatment did not significantly (P>0.05) affect the digestibility of these nutrients. There was gradual decline in their digestibility with increased DPM level in the diet which may be due to lower energy content of the DPM diet and this reflected in a gradual decline in average daily weight gain of 0.65, 0.60, 0.48 and 0.44kg for diets A, B, C and D respectively (Table 4). These findings are similar to those reported by other authors (8, 24).

In general, the results showed greater values for apparent digestibility of dry matter, crude protein, crude fibre, either extract, nitrogen free extracts for the control (A) than for the DPM supplemented diets. These findings are in agreement with those of other authors (24,25,26,).

The better performance of the animals on control diet (A) over the other diets could be due to the high rumen undegradable proteins contained in diet (A) compared to diets B, C, and D. PKM contains higher rumen undegradable proteins than DPM; therefore, the higher the PKM in the diet the higher the amount of rumen undegradable protein supplied by the diet. PKM which formed the bulk of diet A, being an oil seed cake had undergone heating during the process of oil extraction and this could have enabled more of it to escape the rumen fermentation. The nutritive value of protein for ruminants can be improved by heating as this makes the protein less soluble and therefore more likely to escape rumen fermentation (27). As the level of PKM in the diet decreased, the apparent digestibility of the parameters also decreased. Diet D with the highest amount of rumen degradable protein recorded the least nutrient digestibility value. The better performance of weaners on diet A is an indication that the diet was better utilized and this is closely followed by diets B, C and least for D.

Conclusions and Application

Supplementation of DPM based concentrate diet significantly (P< 0.05) improved the performance of Bunaji weaner cattle over the unsupplemented group. Supplementation should therefore be encouraged particularly during the dry season. However, DPM can be included at 18.0% for optimum performance and nutrient utilization.

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