SUB-THEME: RUMINANT NUTRITION

EFFECT OF PHOSPHORUS AND UREA SUPPLEMENTATION ON MILK YIELD AND COMPOSITION IN LACTATING BUNAJI COWS

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ABSTRACT
The objective of this study was to determine the effect of Phosphorus and Urea as supplements for milk production in Bunaji cows. In this study, on farm evaluation of five dietary treatments on milk production were conducted.Three lactating Bunaji cows were allocated to a treatment in a Completely Randomised Design (CRD). The Treatments were negative control (NC), positive control (PC), urea (U) and Single Super Phosphate (P) fertilizers and U+P. Results obtained revealed that, the treatments ($P<0.05$) affected the ash, dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE) and nitrogen free extract (NFE) contents. Significant ($P<0.05$) difference existed between NC and PC for ash (3.60% vs 4.50%). NC, P and U+P s upplementation affected DM ($P<0.05$). The highest daily milk yield (1.64kg) was obtained from U+P treatment. A significant ($P<0.05$) difference existed between NC and PC in ash (0.78±0.02% vs 0.65±0.04%) and the Fat (3.3±0.11% vs 2.3±0.29%). Trend of milk production increased from day 0 to day 90 with a 3 times increase in milk yield from U+P treatment. Minerals in milk of cows supplemented with U+P significantly ($P<0.05$) affected Ca P and K. It is therefore concluded that U+P treatment was superior amongst the treatments thus, supplementation of Bunaji dams with U+P is recommended for increased milk production in Sudan Savannah Zone of Nigeria.
Key words: Bunaji, Milk, Yield, Supplementation, minerals.

INTRODUCTION
World population has been reported to be 7,773 billion as of 2020 and the annual growth rate (% per annum) is estimated to increase by 7.2%. Nigeria, the most populous nation in black Africa has human population of 206.1 million as of 2020 which is expected to increase to 261.7 million and 396.5 million in the years 2030 and 2050, respectively (World Population Data Sheet: WPDS, 2020).

In Tropical and sub-tropical regions, dairy cattle usually depend exclusively on native or introduced pastures as their only source of nutrients, and in particular, during the dry season, the animals cannot fulfill their nutrient requirements due to forage scarcity or of low quality (Soto, Rubio, Galina, Castillo and Rojas, 2001). Therefore, there is the need to integrate a ration with the optimum level of nutrients to meet grazing animal's requirements. This fodder deficit in the dry season combined with the depreciation of the feed quality and the high cost of feed leads to a nutritional deficiency especially in lactating cows.
Generally, mineral sources from organic feeds (forages, grains and their by-products) and inorganic have to be supplemented to balance the mineral contents in the feed. It has been observed that dietary minerals supplementation enhanced milk production, milk composition (Abo, Fathy and Abdou, 2004) and fertility (Saghar, 2003) in Nili-Ravi buffaloes. According to Rekhis, Kouki, Dhaouadi and Kholif (2001).

MATERIALS AND METHODS
The study was conducted at Gaida town (longitude $11^0$56' 03.3"N and latitude 008^0 28' 21.6" E at 478m above sea level) in Kumbotso Local Government Area of Kano State. The area is characterized by sparsely distributed vegetation with densely packed houses.
Fifteen (15) lactating Bunaji Cows at Gaida town, in Kumbotso LGA managed by the Fulani herders with an average weight of 270 $\pm$ 30 kg were used for the study. The experiment lasted for a period of 90 days. During the trial, the lactating animals were supplemented with the experimental diet which consisted of negative contro (NC), positive control (PC),urea (U), phosphate fertilizer (P) and (U+P) were offered in a Completely Randomised Design. (CRD).
Milking was done in the morning around 7:30h manually after sepaeration of cow and calf over night at 7:30 h. Data collected for milk yield, milk quality and mineral composition were subjected to analysis of

variance (ANOVA) using CRD model ($Y_{ij} = U + T_i + E_{ij}$) in SAS (2003) package. The means were separated using Fisher's least significant difference (FLSD) at 5% probability level ($P < 0.05$).

RESULTS AND DISCUSSION

Table 1: Effect of P and U based dietary supplements on milk yield (kg) and milk Composition (%) in Bunaji Dams

	Treatments					
Parameters	NC	PC	U	P	U+P	LSD
MY	1.512	1.281	0.935	0.817	1.635	1.145
TS±SE	25.7±1.43	24.1±3.99	24.7±0.51	24.6±1.76	27.6±1.03	6.163
Ash±SE	0.78±0.02^{b*}	0.65±0.04^{c}	0.91±0.02^{a}	0.85±0.02^{ab}	0.82±0.03^{ab}	0.113
Fat±SE	3.3±0.11^{a}	3.1±0.21^{ab}	2.9±0.46^{ab}	2.5±0.17^{ab}	2.3±0.29^{b}	0.802
Protein±SE	2.8±0.19	3.0±0.07	2.9±0.11	3.0±0.07	2.8±0.14	0.358
SNF±SE	22.4±1.52	21.9±4.15	21.9±0.23	22.1±1.60	25.3±1.06	0.281

NC=negative control; PC=positive control; U=urea; P=phosphorus; U+P=urea+phosphorus; LSD = Least Significant Difference

The treatments did not significantly influence ($P>0.05$) the milk yield (Table 1). The highest daily milk yield (1.64 L) was obtained when U+P was supplemented while the least daily milk yield (0.817 L) was obtained with P supplementation.

	Treatments					
Parameters	NC	PC	U	P	U+P	LSD
Na	612.7	527.0	454.3	502.5	698.5	453.4
P	826.5^{a*}	577.1^{b}	599.7^{b}	592.8^{b}	624.1^{b}	183.0
K	2053.3^{a}	1190.5^{b}	1413.7^{b}	1503.0^{b}	1250.0^{b}	449.1

There was no significant difference ($P>0.05$) t in total solids (TS), protein and solid-non-fat (SNF) but significant difference existed ($p<0.05$) between the treatments in ash and the fat content. U+P had higher value of TS (27.6±1.03%) and PC had the least (24.1±3.99 %). Treatment PC and P had a higher value of protein (3.0±0.07) and treatment U+P had the least value (2.8±0.14). In U+P supplementation SNF was higher (25.3±1.06%) and in U supplementation a least value of SNF was obtained (21.9±0.23%).

The increase in milk production (1.65kg) was 100% higher in treatment U+P than treatment where P alone was given as supplement This is comparable to results reported by Annor (1996), and Millogo *et al*. (2008) (1.8, and 2.3 litres, respectively). Milk yield obtained agreed with (Muhammad *et al.,* 2006) who reported milk yield from Bunaji, cows as 1.20±0.12 litre/cow at Gangara. This is also similar to various reports by Ndione *et al*. (2014) and Sanusi *et al*. (2012).

The values of TS recorded (24.1±3.99 to 27.6±1.03 %) in milk for the treatments were greater than the 12.66% reported by Nasiru (2006) in indigenous breeds. Generally, the values for milk protein obtained in this study were below the range of values (3.38 to 3.65%) reported by Tona *et al*. (2015) for White Fulani Cows and with several authors, (Ehoche *et al.* (2001); Barje (2006); Texeira *et al.* (2015) and Finangwai, 2014). The values reported for Muturu (3.04± 0.22) by Tayo *et al*. (2005) were in agreement with values from the present study.

Table 2: Effect of P and U based dietary supplements on mineral composition (mg/kg) in milk of Bunaji cows

Ca	1813.7[a]	1053.9[b]	968.1[b]	980.4[b]	1139.7[b]	429.8
Ca : P	2.19 : 1	1.83 : 1	1.61 : 1	1.65 : 1	1.83 : 1	

*ab Means with different letter superscript along same column differed significantly (P<0.05)

Table 2 presents minerals in milk of Bunaji cows supplemented with P and U. The treatments did not show any significant variation (P>0.05) in the values for Na. The highest value was obtained when U+P was supplemented while the least value (453.4 mg/kg) was obtained in U supplementation. Supplementation with PC, U, P and U+P showed statistical similarity (P>0.05) in the values for Phosphorus but treatment NC varied significantly from other treatments. The highest value observed was 826.5 mg/kg at NC supplementation while the least value was 577.1 mg/kg at PC supplementation.

In the present study, calcium and phosphorus contents in the milk ranged from 968.1 to 1813.7 mg/kg and 577.1 to 826.5 mg/kg, respectively. These values are higher than the 500 mg/kg for calcium and 780 mg/kg for phosphorus in the milk of White Fulani cows reported in the research of Dandare *et al*. (2014). The data obtained in this study were in agreement with data reported (1000 to 1120.14) for Ca and (850.03mg to 970.02mg) by Tona *et al*. (2015) and were similar to the 1200mg/day Ca and 700mg/day P recommended daily requirement for human nutrition.

CONCLUSION

It can be concluded that, supplementing lactating Bunaji dam with phosphorus and Urea (U+P) helped to increase milk yield by 78% in 30 days and improved the milk minerals (Ca, P and K). Phosphorus and Urea supplementation increased blood Ca in lactating Bunaji dams by 28%.

Recommendation

Farmers should include Phosphorus and Urea (NPN) in the concentrate feed of lactating cows to encourage the production of Ca, P and K in the milk for humans.

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