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Effects of Wafer As Dry Season Supplement on Uda Sheep Performance in Semi Arid, Nigeria

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Abstract

The present study was conducted to evaluate the performance of the grazing Uda rams supplemented with mineral based wafer in semi-arid, Kano, Nigeria. The result of the proximate analysis of the diets revealed that dry matter (DM) values were similar in all wafer samples. Similarly, the values obtained for ash were also similar. The treatment with urea had higher (19.25%) value of crude protein (CP), while the least (15.75%) value was obtained in the control. The control treatment had the highest (20.3%) value of CF The results obtained for live weight changes in rams fed mineral based wafer did not reveal any significant (P>0.05) differences during the Late Dry Season (LDS) and Late Wet Season (EWS). Urea+ SSP treatment resulted in higher live weight changes in the experimental rams. Irrespective of treatments offered, the data revealed that animals raised during EWS had significantly (P<0.05) higher daily liveweight gain than LDS.It can be concluded that values obtained for live weight changes observed in the present study revealed animal's responded positively to mineral supplementation with increase in live weight changes during LDS. The increases were higher by 12.91% in urea+ SSP treatment compared to the control treatment. It is therefore recommended that the formulation of mineral based wafer with urea + SSP as a dry season supplement enhanced fast growth of the livestock during the dry season in semi arid zones of Nigeria.

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Kurak Mevsim Takviyesi Olarak Gofretin Yarı Kurak, Nijerya'da Uda Koyun Performansına Etkileri

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Öz

Çalışma, yarı kurak, Kano, Nijerya'da mineral bazlı gofret ile takviye edilmiş otlayan Uda koçlarının performansını değerlendirmek için yapılmıştır. Rasyonların ortalama analiz sonuçları, tüm gofret örneklerinde kuru madde (KM) değerlerinin benzer olduğunu ortaya koymuştur. Aynı şekilde kül için elde edilen değerler de benzerdir. Üre ile muamelede ham protein oranı (%19.25) kontrol grubundan (%15.75) daha yüksek değerde bulunmuştur. Kontrol grubu en yüksek (%20.3) Ham Selüloz değerine sahiptir. Mineral esaslı gofret ile beslenen koçlarda canlı ağırlık değişimleri için elde edilen sonuçlar, Geç Kuru Sezon (GKS) ve Geç Islak Sezon (GIS) dönemlerinde önemli (P>0.05) farklılıklar ortaya koymamıştır. Üre+SSP uygulaması, deneme koçlarında daha yüksek canlı ağırlık değişiklikleri ile sonuçlanmıştır. Uygulanan muamelelerden bağımsız olarak, veriler, GIS sırasında yetiştirilen hayvanların GKS'den önemli ölçüde (P<0.05) ve daha yüksek günlük canlı ağırlık kazancına sahip olduğunu ortaya koymuştur. Bu çalışmada gözlemlenen canlı ağırlık değişimleri için elde edilen değerlerin, GKS sırasında canlı ağırlık değişimlerindeki artışı ile hayvanın mineral takviyesine olumlu yanıt verdiği sonucuna varılabilir. Artışlar, üre+SSP muamelesinde kontrol grubuna göre %12,91 daha yüksekti. Bu nedenle, kuru mevsim takviyesi olarak üre + SSP'li mineral bazlı gofret formülasyonunun, Nijerya'nın yarı kurak bölgelerinde kuru mevsim boyunca canlıların hızlı büyümesini arttırdığı söylenebilir.

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Introduction

In the tropics the major limiting factor among others for livestock production is nutrition both in term of quantity and quality, especially in dry season (Mahala, *et al.,* 2009; Takele *et al*., 2014). Often by the end of the dry season, animals are emaciated, which sometimes led to death in large numbers if the rains were delayed. While animal scientist have conducted extensive research in the field of mineral nutrition in the United State, Australia and New Zealand and in the part of Eastern Europe, relatively little work has been done on this subject on African countries (Schillhorn and Loeffler, 1990). However, report emanating from Kano, semi-arid zone, indicated that in the dry season, the mineral is equally critical resulting in ruminant livestock licking urinary spot which Muhammad (2008) attributed to symptom of mineral deficiency. An adequate supply of high quality feed throughout the year is a primary basis for increasing animal production. The existing vegetation in the most tropical grasslands well not supports a high level of animal performance (Masikati, 2010). The large amount of energy are life stored in the form of the dry mature herbage in these grassland. This energy can be utilized to improve livestock performance significantly during period of stress by providing supplements to raise the overall nutritive value of feed ingested by animals. One of the conventional approaches is wafers conserved during period of abundant supply so as to redistribute the supply over the year to meet the requirements of livestock resources (Mubi *et al.,* 2013). Its formulation is not a common practice among livestock producers in semi-arid zone, but available option of succulent feed conservation for use in the dry season (Mohammed, *et al.,* 2016). The wafer feed must contain protein, energy and minerals needed by animals to increase productivity (Retnani *et al,* 2010). The objective of this study was to assess the nutritive value of livestock formulated wafers and its effect on the performance of Uda ram grazed semi-arid zone of Nigeria.

Material and Methods

Study area

The experiment was conducted at the Teaching and Research Farm, of Faculty of Agriculture, Bayero University Kano. Kano is located at (11059'N and 8026'E) in the semi-arid zone at an altitude of 460m above sea level. The area is characterized by tropical wet and dry climate; a dry season (Oct -April) and wet season (May-Sept.) with annual rainfall ranging between 787-960 mm. The location has about 4-8 months of the dry season with maximum and minimum temperatures of 33 and 15.2 ^{0}C, respectively. The temperature goes as low as 100^{0}C during harmattan (Knarda, 2011).

Formulation of Mineral Based wafers

The mixing procedures involved weighing each of the ingredients mentioned in Table 1 and their respective proportions to make a 25 kg mixture. Cassava Starch was added into boiling water, stirred and left to cook for 5 minutes and used as binder. The starch made was added to other ingredients and mixed thoroughly for 15 minutes to obtain a homogeneous mixture in the water basin. Additional 17 liter of water was added to the 25 kg ingredients to ensure a good mixture.

Table 1. Proportion (%) of Ingredients for Wafer Preparation

Treatments	Min	GNC	Molasses	RS	Starch (Binder)	Maize	NaCl	%
Urea	1	10	10	24	30	24	1	100
SSP	1	10	10	24	30	24	1	100
Urea + SSP	1	10	10	24	30	24	1	100
Control	0	10	10	25	30	24	1	100

Min = Mineral, GNC = Groundnut cake and RS = Rice straw

The mixed materials were placed into a wooden mould lined with a nylon sheet to prevent the wafers from sticking to the ground and to allow easy removal from the moulds. The dimensions of the wooden mould were 35cm length x21cm width x6cm height (L x W x H). The moulds were removed away from the compressed wafer after 30 minutes and air dried in the sun for 7 days. Upon drying, a two-step storage tables were constructed using wood measuring 2.77cm x 1.15 x 90cm (L x W x H) and protected using wire mesh.

Experimental animals and their management

Sixteen Uda rams with an average weight of 24.30±0.11 Kg was purchased from the local market around Kano. The animals were quarantined for a period of two weeks at Teaching and Research Farm of the Department of Animal Science, Bayero University, Kano. The animals were dewormed with Albendazole suspension at 25 mg/kg orally and sprayed with pouring on (Cypermethrin) at 5ml/animal against endo and ecto parasites. A broad spectrum antibiotic (Oxytetracycline) long active at 1ml/10kg body weight and multi-vitamin injection were also given at 1ml/10kg. The animals were managed under semi intensive system of production. All animals were grazed during the day for 12 months. During the late dry (LDS) and early wet seasons (EWS) animals were supplemented to reduce the nutritional stress. Daily supplements of wafer were given to animals (at 1% of their body weight) in a single meal at 17 hours in the metabolism pens, Records of live weight of the animals were taken fortnightly at 8 hours before the commencement of the daily grazing. The experimental design used was 2(seasons) X 4 (mineral treatments) factorial lay out in Randomized Complete Block Design (RCBD).

Chemical Analysis

Wafer Samples per treatments were analyzed in duplicates for N in plant material using the Micro-Kjeldahl method. Percentage crude protein (CP) was calculated as N X 6.25. Ether Extract (EE), Nitrogen Free Extract (NFE), DM and Ash were determined according to procedures outlined by AOAC (2016). Neutral detergent fiber (NDF) and Acid detergent fiber (ADF) were determined using the method of Van Soest *et al.* (1991).

Data Analysis

Data generated from live weight changes were analyzed using general linear model of 2X4 factorial in Randomized Complete Block design using SAS (2002). Differences between means were considered significant at the probability level of (P= 0.05). Means were separated using Least Significant Differences (LSD).

Results

Table 2 shows the Proximate and fiber fractions of minerals based wafer treatments (Urea, SSP, urea+ SSP and control) as a dry season feed supplement for livestock in semi-arid, Nigeria. The dry matter (DM) values were similar in all wafers samples, which ranged from 97.05% to 98%. The higher DM values were obtained for Urea relative to that of urea +SSP (97.4%) as the least. The values obtained for ash were also similar; with urea based treatment having higher (4.9%) value, whereas the least (3.51%) was obtained for control. Values for Ether Extraction (EE) ranged from 6.7% in SSP to 9% in urea based treatments. Higher value of crude protein (CP) (19.25%) was obtained for urea treatment followed by that of urea + SSP treatment 19.17%, while control was the least (15.75%). Value obtained for Crude Fiber (CF) (20.3%) was higher compared to control, whereas value obtained for urea was the least (17%). Neutral Detergent Fiber (NDF) value obtained for control was higher 35.21%, followed by urea + SSP (34.47%), and SSP, (34.44%). Whereas the least (27.94%) value was obtained for urea. Contents of acid Detergent Fiber (ADF) ranged from 17.34% to 23.32%. Higher values were obtained from SSP (23.32%) and control (23.31%) while urea + SSP treatments had the least (17.34%). Figure 1 presents the trend of live weight changes of animals supplemented with the different mineral based wafer treatments during LDS and EWS. The results did not present significant (P>0.05) variations among the treatments evaluated. In both seasons urea+ SSP treatments were higher followed by urea treatment based wafer, while control was the least. Live weight gained of animals fed wafers with different mineral treatments showed a general increase in EDS and slightly declined thereafter in EWS. Figure (2) presents the effect of season on the mean live weight changes of sheep grazed native pasture in the semi-arid Zone of Nigeria. Irrespective of treatments offered, the data revealed that animals raised during EWS had significantly (P<0.05) higher daily live weight gain than LDS.

Table 2. Proximate and fiber fractions (%) of mineral based wafers a dry season supplements for livestock grazed native pasture in semi arid, Nigeria

Trt	DM	ASH	EE	CP
Urea	98.00	4.90	9.00	19.25
Urea+ SSP	97.40	3.57	8.10	19.17
SSP	97.50	3.65	6.70	17.25
Control	97.50	3.51	8.60	15.75
SE±	0.392	0.664	1.00	1.680

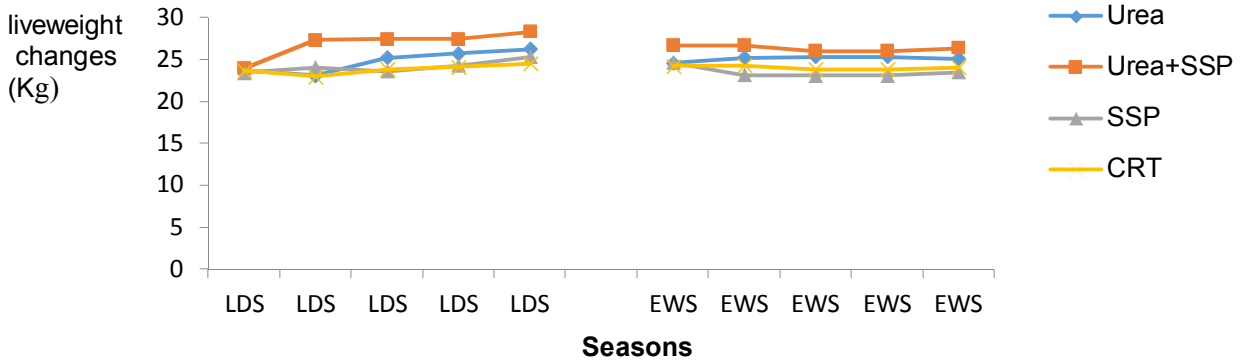

Figure 1. The trend of liveweight changes of rams supplemented in the LDS and EWS with wafers, in semi-arid Nigeria

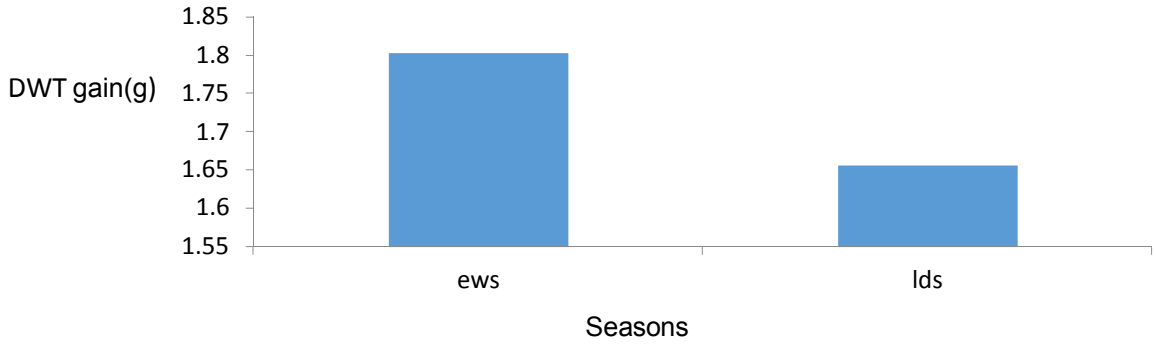

Figure 2. Effect of season on thedaily liveweight gain of sheep supplemented with mineral based wafer in semi arid Nigeria

Discussion

The higher value obtained for ash in urea treatment could be attributed to the mineral contents of urea. Similar value obtained for EE for all treatments could be attributed to the low or no oil content of minerals. However, higher values of CP and ADF were reported for urea treatment, while the lowest value was reported for control, this may be due to the nitrogen contents of the urea which could have been converted to ammonia and protein by the rumen micro flora in the rumen. Karimi *et al*., (2014) reported that supplementation of rice straw with protein, energy and minerals may optimize rumen function, also maximizing utilization of the rice straw and increasing intake. The CP content of four types of wafers ranged from 17.75% to 19.5% indicates a diet high in nutrient that can serve as supplement for both growth and development for young animal as well as pregnant and lactating animals NRC, (2001) recommended 12% and 16.5% as a CP requirement for young and lactating animals, respectively. The higher value for NDF reported for control might be attributed to the high proportion of rice straw in the control compared to others. The low value of NDF reported for urea is possibly due to solubilization of hemicelluloses content during treatment with urea (Pathak *et al.,* 2005). The trend of live weight changes noted in the present study of mineral based wafer as dry season supplements revealed animal's responded positively to mineral supplementation with increase in live weight changes during LDS. The increases were higher in the urea+ SSP treatment by 12.91% compared to the control treatment, while urea treatment was increased by 4.06% compared to the control. Findings from the present study revealed during the EWS there was a slight decline in the live weight of the animals fed mineral based wafer with the exception of urea treatment. However, inspite of the deceases, animals supplemented with urea + SSP were better than the control treatment

by 9.59%, while animal supplemented with urea treatment were better than the control treatment by 4.40%. Muhammad (2004) reported that the none response for P supplementation by animals could be attributed to naturally low P status of the animals at the commencement of feeding trail. Winter (1990) reported that responses to P are circumstantial on the P level in the diet, P status of the animal, physiological state and supply of other nutrients in the diet. Furthermore growths responses occur only when the animal is on a positive nutritional plane, which was difficult to discover in the present study. The observed manifestation of weight gained as a result of differences due to the seasons was obvious. While animals consumed all the wafers offered during LDS, contrary observation were noted during the EWS where part of the wafers was left unconsumed yet animals had 5.58% higher live weight gained during the EWS which is attributable to ingestion of dried wafers along with grazing of the early sprout of green grass. Finding from this work revealed clearly that when animals were supplemented with the dry fed yet grazing fresh grass, may not lose weight compared to when animals grazed fresh grass alone high in moisture contents with the corresponding low dry matter.

Conclusion

It can be concluded from the result of the present study that, to address the dry season feed scarcity and weight loss from animal, mineral based wafer is a good option since result from this study revealed formulation of mineral based wafer improves livestock performance during dry season. It is therefore recommended that the formulation of mineral based wafer with urea + SSP as a dry season supplement enhanced fast growth of the livestock during the dry season in semi-arid zones of Nigeria.

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