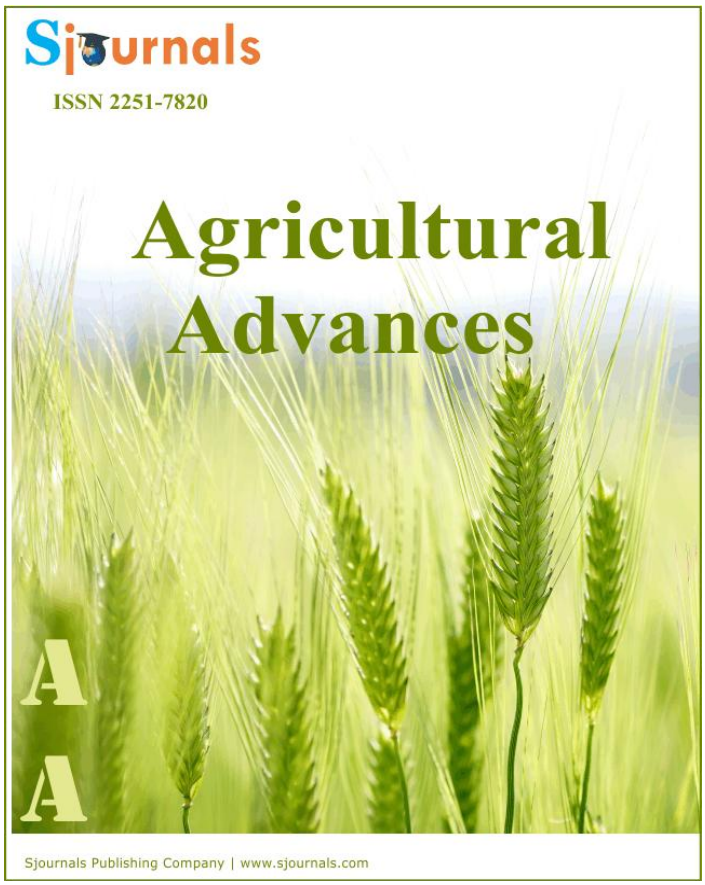

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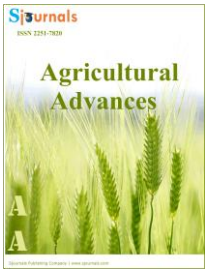

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Original article

Dry layer litter and rice husk: Alternatives to feed supplements in improving semen quality of red Sokoto bucks

Aliyu Jibril[a,*], Hamidu Sharubutu Garba[b], Yunusa Alhaji Adamu[b], Mohammed Aminu Umaru[a]
[a]*Department of Theriogenology and Animal Production, Usmanu Danfodiyo University, Sokoto.*
[b]*Department of Veterinary Medicine, Usmanu Danfodiyo University, Sokoto.*

*Corresponding author: aliyu.jibril@udusok.edu.ng

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ABSTRACT

The effect of using dry layer litter and rice husk as alternative feed source on seminal characteristics of red Sokoto bucks was investigated in a 98 day study using eighteen healthy Red Sokoto bucks. The bucks were divided into 3 groups (A, B and C) of 6 bucks each. Concentrate containing 15.01% CP was formulated using conventional feed sources and fed to group A, while group B were fed 15.13% CP concentrate formulated using dry layer litter (DLL) and rice husk (RH). Group C (control) was not fed any supplement. All groups were fed a basal diet of *cowpea* hay and water *ad libitum*, while supplements were fed at 2% body weight in two divided portions. Feeding 15.13% CP diet formulated using RH and DLL favoured spermatogenesis in Red Sokoto bucks as evident from increased semen concentration by 160×10^6/ml at day 98, high percentage viable spermatozoa (74.89%) and high percentage spermatozoa with normal morphology (77.55%). This was attributed to high available nitrogen from the poultry litter and its utilization by the rumen microflora making it available for absorption leading to improved spermatogenesis. It was concluded that, feeding dried layer liter and rice husk as alternative feed supplements resulted improved semen quality of red Sokoto bucks. It is therefore recommend that dried layer litter and rice husk can be used as a feed supplements for red Sokoto bucks as they can compete with feed from conventional sources.

1. Introduction

Nutrition plays a major role on enhancing reproductive efficiency in animals (Bindari et al., 2013; Hosseini and Eslamian, 2014) where inadequate nutrition may lead to decline in their fertility. Infertility is one of the most serious problems in animal production, resulting in culling of farm animals (Fayemi, 2006). This problem leads to low livestock productivity thereby resulting in low animal protein availability for human consumption especially in developing countries (Attah et al., 2006). Inadequacy of animal feed resources and poor quality feeds especially during the dry season is a real challenge facing livestock production in tropical developing countries (Lanyasunya et al., 2006; Katongole et al., 2012). In the tropics during dry season, most livestock rely heavily on natural grass and crop residues most of which fall short of the minimum CP requirement of small ruminants (Abusuwar and Ahmed, 2010). Prolong inadequate protein intake reduces reproductive performance due to its negative impact on feed intake, feed passage rate and overall digestive efficiency (Krishnan et al., 2014). Feed supplements rich in protein can be offered to animals to boost their crude protein intake, but high competition for conventional feedstuffs between man and animals results in unstable and increasing prices of these feed stuffs, necessitating the quest for an alternative. One possible non-conventional supplement to crop residues that can increase the nitrogen content of the diet is broiler litter (Saleh et al., 2002). El- Sabban et al. (1970) reported that the utilization of by products or waste materials in animal feeding is enthused by finding an economical and beneficial means of disposal thereby reducing environmental pollution and sparing the land used in the production of livestock feeds for crops which can be used directly for human consumption.

Poultry litter is high in nitrogen, about 4.6% dry matter, and of low to moderate organic matter digestibility. Also nitrogenous compounds in poultry litter of which up to one-half are in the form of protein, are generally degraded rapidly to ammonia in the rumen (Animut et al., 2000). Research has shown the successful inclusion of poultry litter in the diets of ruminants at different ages and physiological states (El-Sabban et al., 1970; Fontenot, 1996; Saleh et al., 2002; Jibril et al., 2011), but there is little data on the use of poultry litter in diets to improve the reproductive performance of small ruminants' especially male goats. Therefore, this study was conducted to evaluate the effect of feeding dry layer litter and rice husk on seminal characteristics of red Sokoto bucks

2. Materials and methods

The research was conducted in the experimental unit of Usmanu Danfodiyo University Veterinary Teaching Hospital Sokoto. Sokoto lies between longitude 13° 3' 5" North, and latitude 5° 13' 53" East at an elevation of 263m above sea level. Sokoto experiences a short rainy period and a long dry season (Ekpoh and Nsa, 2011). The study was conducted for a period of 98 days. Eighteen healthy red Sokoto bucks, aged 12 months and weighing 11-15 kg were selected for the study. They were randomly divided into three groups of six bucks each. They were managed under intensive system, kept and fed in groups.

Before the commencement of the feeding trials they were acclimatized for four weeks during which they were screened for hemoparasites and helminths. Bucks used for the study were fed a basal diet of hay (*cowpea*) *ad libitum* and given a supplement ration of concentrate mixture of 2% body weight/head/day in two divided portions. Two iso-nitrogenous ration (15% CP) were formulated using non-conventional feed stuffs {Rice husk (RH) and dry layer litter (DLL)} and conventional feed stuff. Group A were fed a concentrate supplement formulated using conventional protein sources while group B were fed concentrate supplement formulated using rice husk and dry layer litter. All test diets were subjected to proximate analysis using the method of AOAC (1990).

Semen samples were collected fortnightly between 09.00 and 11.00 h using an electro-ejaculator at the dose rate of 12 volts DC at 10 seconds interval. The bucks were adequately restrained; the prepuce was washed and dried. The lubricated probe of the electro-ejaculator was inserted into the rectum and switched on to produce an erection and subsequently ejaculation. Ejaculated semen was collected in a calibrated tube and placed in water bath set at 37˚C.

The volume of semen was measured directly from the calibrated tube used as collection vial and then kept water bath set at 37˚C. Microscopic examination for wave pattern (gross sperm motility) was determined by examining a drop of raw undiluted semen on a pre-warmed slide at 37˚C under a light microscope at ×40 magnification objective. Samples were observed for swirl movement of the sperm cells to give an estimation of mass activity as described by Rehman et al. (2012). Semen pH was determined using a pH paper. Sperm

concentration was determined using a haemocytometer as described by Bailey et al. (2007) while sperm viability and morphology were determined according to the method of Esteso et al. (2006).

Data collected were expressed as means and their standard deviation (SD). Significance of differences between treatments means were estimated at P≤0.05 with Tukey-Kramer multiple comparison test of repeated measure analysis of variance (ANOVA). Analysis was conducted using the Graphpad Instat computer programme (Graphpad, 2000).

3. Results and discussion

Ingredients and chemical compositions of feeds formulated and fed to the experimental groups are presented in Tables 1 and 2. Diet fed to group A were formulated using non conventional feed ingredients (dried layer litter and rice husk) while that of group B was formulated using conventional feed sources with corn, wheat offal and ground nut cake as major ingredients. Feed formulated were iso-nitrogenous where feed A and B contained 15.01% CP and 15.13% CP respectively (Table 1). The energy level for group A diet was 10.54 MJ/Kg DM ME, while group B diet had 6.48 MJ/Kg DM ME (Table 2).

Table 1
Ingredients composition of diets fed to red Sokoto bucks.

Ingredients/Nutrient (%)	A (15% CP)	B (15% CP)
Ground corn	-	71.4
Groundnut cake	-	16.4
Wheat bran	-	10.2
Common salt	-	0.50
Bone meal	-	1.25
Vitamin premix	-	0.25
Dry layer litter	52.3	-
Rice Husk	47.7	-
Total	100.00	100.00

Table 2
Chemical composition of diets fed to red Sokoto bucks.

Chemical composition	A	B
DM (%)	96.62	94.16
CP (%)	15.13	15.01
EE (%)	31.17	25.32
CF (%)	27.50	32.66
Ash (%)	21.28	3.42
Energy MJ/Kg DM ME	6.48	10.54

Bucks fed supplements containing DLL and RH had a mean cumulative sperm concentration of 294.88×10^6/ml which was higher than that recorded for group C (control) with a mean sperm concentration of 244.54×10^6/ml, but lower than values obtained from group B fed supplements from conventional feed stuff and had a mean sperm concentration of 324.04×10^6/ml (Table 3). The semen concentration recorded for group A fed RH and DLL did not differ significantly with that of group B fed supplements from convention sources (P>0.05).

The study has also shown that addition of rice husk and poultry litter had a significant effect on semen concentration of goats thereby increasing it by 252.17×10^6 cell/ml over a period of 98 days with the peak semen concentrations at days 42 and 56 (Fig. 1). The mean semen volume obtained from the bucks in different groups was 0.52ml, 0.36ml and 0.45ml for groups A, B and C respectively and these volumes did not differ significantly (p>0.05) (Table 3).

No significant differences (P>0.05) in gross sperm motility, sperm viability and morphology were observed in this study (Table 3), even though the viability in all groups was above 70%, with group A having the highest viability of 74.89%. Bucks fed supplements containing DLL and RH had a mean cumulative sperm concentration of

294.88×10^6/ml which was higher than that recorded for group C (control) with a mean sperm concentration of 244.54×10^6/ml, but lower than values obtained from group B fed supplements from conventional feed stuff and had a mean sperm concentration of 324.04×10^6/ml (Table 3). The semen concentration recorded for group A fed RH and DLL did not differ significantly with that of group B fed supplements from convention sources (P>0.05).

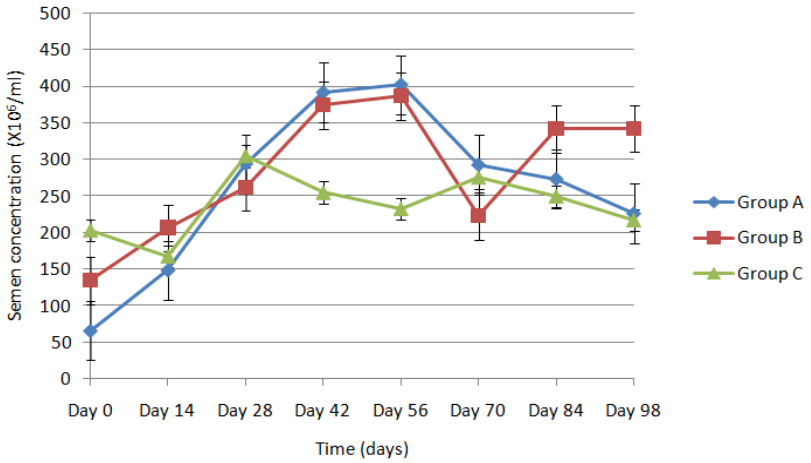

Fig. 1. Semen concentration (×10^6/ml) of red Sokoto bucks fed experimental diets.

Table 3
Mean±SD semen characteristics of red Sokoto bucks fed supplement diets.

	Groups		
	A	**B**	**C**
Volume (ml)	0.52±0.41	0.36±0.24	0.45±0.31
Motility (%)	69.62±18.24	64.14±16.04	62.71±16.91
Concentration (×10^6/ml)	294.88±138.52^{ab}	324.04±120.04^{a}	244.54±109.61^{b}
Viability (%)	74.89±24.11	72.1±19.90	71.24±20.55
Normal sperm morphology (%)	77.55±6.71	79.77±7.91	74.68±10.68
pH	7.60±0.81^{a}	8.27±0.96^{b}	8.06±1.01^{b}

^{ab} Means in same row with different superscript alphabets are statistically (P<0.05) different.

The study has shown that addition of rice husk and poultry litter had a significant effect on semen concentration of goats thereby increasing it by 252.17×10^6 cell/ml over a period of 98 days with the peak semen concentrations at days 42 and 56 (Fig. 1). Significantly higher semen concentration (P<0.01) observed in the group fed rice husk and poultry litter may be due to increase in available nitrogen from the poultry litter and its efficient utilization by the rumen microflora to make it available for absorption. The findings in this study corroborated with Jibril et al. (2011) who reported an improvement in semen concentration in rams fed poultry litter based feed containing 14.96% CP. The finding also agrees with Fenandez et al. (2004) who found that increased dietary protein supply favours spermatogenesis.

The volume of semen obtained from the bucks in different groups was 0.52ml, 0.36ml and 0.45ml for groups A, B and C respectively (Table 3). There seems to be no significant difference in the semen volume (p>0.05) in this study. This finding is consistent with those recorded by Fourie et al. (2004) and Kheradmand et al. (2006) in rams, Abi-Saab et al. (2008) in bucks as no significant differences in the semen volume were observed when they were fed nutritional supplements.

No significant differences (P>0.05) in gross sperm motility were observed in this study. Gross motility was above 60% for all groups; this indicates that feeding supplements does not affect gross sperm motility. Similar result was reported by Elmaz et al. (2007) who obtained no significant difference in sperm motility in rams lambs fed supplement diets.

No significant difference in percentage live/dead ratio (viability) was observed in this study. Viability in all groups was above 70%, with group A having the highest viability of 74.89%. This result is in agreement with the

findings of Rekwot et al. (1987) and Kheradmand et al. (2006) who recorded no statistically significant differences in the viability of sperm cells of bulls placed on different protein diets.

Percentage morphologically normal and defective spermatozoa of red Sokoto bucks were not affected by supplement diets fed in this study. This may be explained by the fact that percentage morphologically normal spermatozoa increases as the male ages and reach puberty as reported by Rekwot (1987); bucks used for the study have attained puberty. This is also an indication that inclusion of poultry litter in diet of red Sokoto bucks has no effect on the morphology of spermatozoa as there were no significant difference between the three treatment groups ($P>0.05$). The finding is consistent with that of Barth et al. (2008) who found that percentage morphologically normal spermatozoa was not affected by medium or high level of nutrition.

Diets formulated for groups A and B contained 15.01% CP and 15.13% CP respectively, which is within the optimum range for enhancing reproduction as reported by Jibril et al. (2011) in Yankasa rams. The higher energy value of 10.54 MJ/Kg DM ME obtained in feed formulated for group A when compared with that of group B with 6.48 MJ/Kg DM ME is as a result of the high energy ingredients (corn and wheat bran) used in the feed formulation.

Higher semen concentrations observed in the groups when compared with the control may be as a result of the high crude protein intake leading to increase in available nitrogen especially from the poultry litter and its efficient utilization by the rumen microflora to make it available for absorption. The findings in this study corroborated with Jibril et al. (2011) who reported an improvement in semen concentration in rams fed poultry litter based feed containing 14.96% CP. The finding also agrees with Fenandez et al. (2004) who found that increased dietary protein supply favours spermatogenesis.

Feeding nutritional supplements have no significant effect on semen volume as observed in this study. This finding is consistent with those recorded by Fourie et al. (2004) and Kheradmand et al. (2006) in rams, Abi-Saab et al. (2008) in bucks that no significant differences in the semen volume were observed when they were fed nutritional supplements. Gross motility recorded in this study indicates that feeding nutritional supplements does not affect this parameter. Similar result was reported by Elmaz et al. (2007) who obtained no significant difference in sperm motility in rams lambs fed supplement diets. Similarly no significant difference in percentage live/dead ratio (viability) was observed but group A had the highest viability of 74.89%. This result had a similar pattern with the findings of Rekwot et al. (1987) and Kheradmand et al. (2006) who also recorded no statistically significant differences in the viability of sperm cells of bulls placed on different protein diets.

Percentage morphologically normal and defective spermatozoa of red Sokoto bucks were not affected by supplement diets fed in this study. This may be explained by the fact that percentage morphologically abnormal spermatozoa decreases gradually as the male ages and reach puberty as reported by Rekwot (1987) which results in high percentage normal sperm cells; bucks used for this study have attained puberty and are clinically healthy. This is also an indication that inclusion of poultry litter in diet of red Sokoto bucks has no detrimental effect on the morphology of spermatozoa. The finding is consistent with that of Barth et al. (2008) who found that percentage morphologically normal spermatozoa was not affected by medium or high level of nutrition.

4. Conclusion

Feeding 15% CP diet formulated using RH and DLL favoured spermatogenesis in red Sokoto bucks as evident from the improved semen concentration, high percentage viable spermatozoa and high percentage spermatozoa with normal morphology. Rice husk and dry layer litter ration is recommended during flushing and for improving sperm quality in red Sokoto bucks.

References

Abusuwar, A.O., Ahmed, E.O., 2010. Seasonal variability in nutritive value of ruminant diets under open grazing system in the semi-arid rangeland of Sudan (South Darfur State). Agr. Biol. J. N. Am., 1(3), 243-249.

Animut, G., Merkel, R.C., Abebe, G., Sahlu, T., Goetsch, A.L., 2000. Broiler litter and urea-treated wheat straw as feedstuffs for Alpine doelings. In: Merkel, R.C., Abebe, G., Goetsch, A.L. (eds.). The opportunities and challenges of enhancing goat production in east Africa. Proceedings of a conference held at Debub University, Awassa, Ethiopia from November 10 to 12, 2000. E (Kika) de la Garza Institute for Goat Research, Langston University, Langston, OK, 187-189.

AOAC, 1990. Association of Official Analytical Chemists. Official Methods of Analysis, 15th edition. Washington DC, 69-88.

Attah, S., Omojola, A.B., Adesehinwa, A.O.K., 2006. Yield and carcass composition of goats as affected by breed and slaughter weight. World Appl. Sci. J., 1(1), 8-11.

Bailey, E., Fenning, N., Chamberlain, S., Devlin, L., Hopkisson, J., Tomlinson, M., 2007. Validation of sperm counting methods using limits of agreement. J. Androl., 28(3), 364-373.

Bindari, Y.R., Shrestha, S., Shrestha, N., Gaire, T.N., 2013. Effects of nutrition on reproduction- A review. Adv. Appl. Sci. Res., 4(1), 421-429.

Ekpoh, I.J., Nsa, E., 2011. Extreme climatic variability in north-western Nigeria: An analysis of rainfall trends and patterns. J. Geogr. Geol., 3(1), 51-62.

Elmaz, Ö., Cirit, Ü., Keser, O., Gürbulak, K., Güvenç, K., Kutay, C., 2007. Effect of two dietary protein levels on testosterone, testicular parameters and semen quality in ram lambs during pubertal development. Med. Wet., 63(10), 1177-1180.

El-Sabban, F.F., Bratzler, J.W., Long, T.A., Frear, D.E.H., Gentry, R.F., 1970. Value of processed poultry waste as a feed for ruminants. J. Anim. Sci., 31, 107-111.

Esteso, M.C., Soler, A., Ferna´ ndez-Santos, M., Quintero-moreno, A.A., Garde, J.J., 2006. Functional significance of the sperm head morphometric size and shape for determining freezability in Iberian red deer (*Cervus elaphus hispanicus*) epididymal sperm samples. J. Androl., 27(5), 662-670.

Fayemi, O., 2006. Association of trypanosome infection with sperm antibodies production in red Sokoto (Maradi) goats. Pakistan Vet. J., 26(1), 30-32.

Fernandez, M., Giralde, F.J., Frutos, P., Lavin, P., Mantecon, A.R., 2004. Effect of undegradable protein supply on testicular size, spermiogram parameters and sexual behavior of mature Assaf rams. Theriogenol., 62, 299-310.

Fontenot, J.P., 1996. Feeding poultry wastes to cattle. Report submitted to Roger McNeill, Economist Environment Canada. Suite 700, 1200 West 73rd Avenue, Vancouver, British Columbia, V6P-6HP, Canada.

Fourie, P.J., Schwalbach, L.M., Neser, F.W.C., Van der Westhuizen, C., 2004. Scrotal, testicular and semen characteristics of young Dorper rams managed under intensive and extensive conditions. Small Rumin. Res., 54, 53-59.

GraphPad, 2000. GraphPad InStat version 3.05 for Windows 95, GraphPad Software Inc., San Diego California USA, www.graphpad.com.

Hosseini, B., Eslamian, G., 2014. Association of dietary factors with male and female infertility: Review of current evidence. Thrita, 3(3), e20953.

Jibril, A., Ate, I.U., Rekwot, P.I., Osuhor, C.U., 2011. Effect of graded levels and sources of protein on scrotal circumference and semen profile of Yankasa rams. Sokoto J. Vet. Sci., 9(1), 22-27.

Katongole, C.B., Nambi-Kasozi, J., Lumu, R., Bareeba, J., Presto, M., Ivarsson, E., Lindberg, J.E., 2012. Strategies for coping with feed scarcity among urban and peri urban livestock farmers in Kampala Uganda. J. Agr. Rural Dev. Trop. Subtrop., 113(2), 165-174.

Lanyasunya, T.P., Rong, W.H., Abdulrazak, S.A., Kaburu, P.K., Makori, J.O., Onyango, T.A., Mwangi, D.M., 2006. Factors limiting use of poultry manure as protein supplement for dairy cattle on smallholder farms in Kenya. Int. J. Poult. Sci., 5(1), 75-80.

Rehman, Z.U., Samo, M.U., Qureshi, T.A., Khan, S., Qureshi, M.S., Khan, F.A., Bahadadr, S., 2012. Studies on the freezability of Kundhi buffalo bull semen. J. Anim. Plant Sci., 22(2 Suppl.), 18-23.

Rekwot, P.I., 1987. Effects of varying levels of protein intake on growth, puberty and semen quality of bunaji and friesian X bunaji crossbred bulls. MSc Thesis, Department of Veterinary Surgery and Medicine, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria.

Rekwot, P.I., Oyedipe, E.O., Akerejola, O.O., Kumi-Diaka, J., 1988. The effect of protein intake on body weight, scrotal circumference and semen production of Bunaji bulls and their Friesian crosses in Nigeria. Anim. Reprod. Sci., 16, 1-9.

Saleh, H.M., Elwan, K.M., El-fouly, H.A., Ibrahim, I.I., Salama, A.M., Elashry, M.A., 2002. The use of poultry waste as a dietary supplement for ruminants, In: Development and field evaluation of animal feed supplementation packages, Proceedings of the final review meeting of an IAEA technical co-operation. Regional AFRA project organized by the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture and held in Cairo, Egypt, 43-52.

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