VETERINARSKI ARHIV 76 (2), 159-165, 2006

Effects of different planes of meat offals and soybean meal on the morphological characteristics of West African dwarf buck's spermiogram

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OYEYEMI, M. O., V. O. ADETUNJI, O. OLUBUKOLA: Effects of different planes of meat offals and soybean meal on the morphological characteristics of West African dwarf buck's spermiogram. Vet. arhiv 76, 159-165, 2006.

ABSTRACT

Twenty healthy West African dwarf goats aged between 18 and 24 months old weighing 13-15 kg were assigned randomly to four groups (T1-T4). The experiment lasted for 14 weeks and animals were fed on concentrate containing varying levels of meat offal and soybean meal. Group T1 was fed on 100% soybean meal, group T2 was fed on 35% meat offal and 65% soybean meal, group T3 was fed on 70% meat offal and 30% soybean meal, while group T4 was fed on 100% meat offal. Semen samples were collected from the animals with a weekly interval between collections. Morphological characteristics and concentration of the sperm cells were analyzed. Primary, secondary and tertiary abnormalities were present in all four groups. Secondary abnormalities were the highest to occurr in all these three categories. Looped tail was the highest to occur in all the groups, with group T4 having the highest number and percentage of this abnormality. There was no significant difference among the groups for looped tail abnormality ($P<0.05$). Also, there was no significant difference ($P<0.05$) among the four groups for total secondary abnormalities observed during the experiment. Primary abnormality of rudimentary tail in-group T3 was the highest to occur among the four groups, even though there was no significant difference ($P<0.05$) in the total number of primary abnormalities present. Tertiary abnormalities of stumpy tail were the highest occurring among the groups; there was no significant difference ($P<0.05$) in the total number of tertiary abnormalities. The total percentage of abnormalities i.e. primary, secondary and tertiary for groups T1-T4 were 8.15%, 6.63%, 11.47% and 9.02%, respectively. The values obtained in each group are less than the 20% abnormalities recommended for effective performance. It can therefore be concluded that soybean meal and meat offal as a source of protein in animals have no negative effect on the morphological characteristics and breeding performance of West African dwarf goat bucks.

Key words: meat offal, soybean meal, buck spermiogram, morphology

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ISSN 0372-5480
Printed in Croatia

Introduction

The goat *(Capra hircus* L.) is a multipurpose animal that produces milk, skin, meat and hair. They are able to thrive as meat producers under conditions which other animals may find difficult (OYEYEMI and AKUSU, 1998). They are able to survive on kitchen remnants, crop residue and grasses, and no elaborate housing is necessary (OYEYEMI and AKUSU, 2002).

In the tropics, 59% of the goat populations is found, numerically, to be about 243.49 million, 144.7 million of them in Africa (GALL, 1996). There are about 21 million goats in Nigeria (OTESILE, 1993), which is about 0.76 animals per person (JAHNKE, 1982).

The West African dwarf goat (WAD) is a breed of goat that is of the achondroplastic type, with disproportionately short legs which are often bent, occurring in and near the tropical forest belt in West and Central Africa. Its distribution does not extend to East Africa (JEAN PAGOT, 1993). The West African dwarf goat can also be described as a goat whose average height at withers does not exceed 50 cm (GALL, 1996). They are raised solely for their much-valued meat, which is considered to be of superior quality to that of long-legged goats. Growth rate and milk yields are very low but twin and triplets birth are common and they breed at all times of the year, especially with proper management, i.e. improved husbandry, management-organized breeding and disease control (HAFEZ, 1993).

The identifiable systems, according to ADU and LAKPINI (1989) include the traditional system, which is sub-divided into, first a pastoral system which relies extensively on the rangeland resources of the sub-humid and semi arid areas. Secondly there is the agro-pastoral system in which crops and livestock production is integrated. Animals under this system rely on the crop residues as their major source of feed. Thirdly, there is the village system, in which sheep and goats are not really integrated with crop production, as the farms are at some distance from the homesteads. Another major classification is the modern systems which involve first, the intensive system under which goats are offered a high quality feed without grasses; they are usually kept indoors and all feeds required are brought into their pens. Secondly, the semi-intensive system under which goats usually grass in a fenced pasture, but in addition to this some form of concentrate supplementation is provided. This system is popular among commercial livestock enterprises (OTESILE, 1993).

This investigation is aimed at improving the reproductive potential of WAD buck through meat offals and soybean meal.

Materials and methods

Twenty West African dwarf (WAD) goat bucks aged between 18 and 24 months and weighing between 13-15 kg at the completion of the experiment were used for this experiment, which lasted for 14 weeks. These animals were divided into four groups: T1, T2, T3 and T4 of five animals each.

The WAD goats were intensively managed in four pens measuring 4.7m X 3.14. Fresh water was provided *ad libitum* while the floor litter (wood Shavings) on a concrete floor was changed routinely.

The four groups were fed as follows:

Group T1 100% soybean meal

Group T2 35% meat offal and 65% soybean meal

Group T3 70% meat offal and 30% soybean meal

Group T4 100% meat offal

Animal were dewormed with Barmith$^{F®}$ (Pfizer, Ikeja) and dipped with Asuntol®. Vaccination against pestes de petit ruminants (PPR) was done and veterinary attention was provided when required.

Semen collection was done using the electro-ejaculation method. Samples were collected twice from these animals with a one-week interval between the first and second collection. The collected ejaculated semen was then examined promptly for morphology and concentration.

To determine the morphology of the spermatozoa, a drop of semen was placed on a clean warm glass slide with two drops of wells and Awa stain. These were gently mixed together and a smear was made on another clean warm slide (to avoid cold shock) and air-dried. The slide was observed under a light microscope, (×100 magnification) for the presence of abnormal sperm cells out of at least 600 sperm cells from several fields of the slides. The number of sperm cells and percentages of abnormal sperm cells were noted and recorded.

The concentration was determined by the use of an improved Neubauer haemocytometer. Semen was pipetted to the 0.5 mark on the pipette (using the red blood cell pipette) and this was made up to 1.01 marks on the pipette with normal saline. Normal saline serves both to dilute the semen and fix the spermatozoa present. The pipette is then introduced into pipette shaker and allowed to mix. About 2 to 3 drops of the diluent were discarded from the pipette before it was introduced into the counting chamber of the haemocytometer chamber for counting. The five squares that formed the diagonal segment of the square were counted.

Results

The value of morphological abnormalities and their percentages for the four groups (T1, T2, T3 and T4) are presented in Tables 1-3. It was observed that the secondary abnormality type of which the looped tail was the highest. Values and percentages of looped tail observed for the four groups (T1-T4) were 111 (2.99%), 96 (2.46%), 125 (3.83%), 208 (4.86%), respectively. There was no significant difference among these values ($P>0.05$).

The primary abnormalities seen in the study were piriform heads, narrow heads, abaxially attached mid-piece, rudimentary tail and twin heads. Values for the four groups, (T1-T4) were 5% (0.13%), 1 (0.02%), 32 (0.98%)' 12 (0.28%), respectively. The most prevalent abnormality was the rudimentary tail with the highest values in T3 24 (0.73%). Statistically there was no significant difference (P>0.05) but andrologically or scientifically, group T3 was significantly higher among the four groups.

Table 1. Classification of primary sperm abnormalities per group

Parameter	T1	T2	T3	T4	Total
Total number of sperm cell	3707 (100)	3903 (100)	3267 (100)	4280 (100)	15157
Primary abnormalityes					
Pyriform head	0 (0)	0 (0)	0 (0)	3 (0.07)	3 (0.02)
Small head	0(0)	0 (0)	0 (0)	0 (0)	0 (0)
Narrow head	1 (0.03)	0 (0)	3 (0.09)	1 (0.02)	5 (0.03)
Abaxially attached midpiece	0 (0)	0 (0)	5 (0.15)	1 (0.05)	6 (0.04)
Rudimentary tail	3 (0.08)	1 (0.02)	24 (0.73)	7 (0.16)	35 (0.23)
Twin heads	1 (0.03)	0 (0)	0 (0)	0 (0)	1 (0.01)
Total	5 (0.13)	1 (0.02)	32 (0.98)	12 (0.28)	50 (0.33)

Table 2. Showing secondary abnormalities

Parameter	T1	T2	T3	T4	Total
Secondary abnormalities					
Bent tail	25 (0.70)	8 (0.21)	36 (1.10)	34 (0.79)	103 (0.68)
Looped tail	111 (2.99)	96 (7.46)	125 (3.83)	208 (4.86)	540 (3.56)
Coiled tail	18 (0.49)	2 (0.05)	87 (3.83)	19 (0.44)	126 (0.83)
Curve tail	59 (1.09)	61 (1.56)	5 (0.18)	36 (0.84)	161(1.06)
Detached tail	36 (0.97)	29 (0.74)	49 (1.70)	32 (0.75)	146 (0.96)
Detached galea capitis	1 (0.03)	0 (0)	0 (0)	0 (0)	1 (0.01)
Distal cytoplasmic droplets	3 (0.08)	0 (0)	0 (0)	0 (0)	3 (0.02)
Total	253 (6.82)	196 (5.02)	302 (9.24)	329 (7.69)	1080 (7.12)

The secondary abnormalities observed were of the tail; looped tail, coiled tail, curved mid-piece, detached tail, detached *galea capitis* and distal cytoplasmic droplet. Values for groups T1-T4 were 253 (6.82%), 196 (5.02%), 302 (9.24%), 329 (7.69%), respectively. There were significant differences scientifically, although statistically there were no significant differences among the groups.

Table 3. Tertiary abnormalities

Parameter	T1	T2	T3	T4	Total
Tertiary abnormalities					
Bent midpiece	16 (0.43)	12 (0.13)	10 (0.28)	13 (0.30)	51 (0.34)
Stumpy tail	17 (0.46)	9 (0.23)	27 (0.92)	31 (0.72)	84 (0.55)
Knobbed midpiece	11 (0.30)	0 (0)	2 (0.05)	1 (0.02)	14 (0.09)
Medusa head	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total	44 (1.19)	21 (0.58)	39 (1.19)	45 (1.05)	145 (0.95)
Total abnormalities	302 (8.15)	218 (6.63)	373 (11.49)	386 (9.02)	1275 (8.41)

Tertiary abnormalities seen were bent mid-piece, stumpy tail and knobbed mid-piece. The values among the four groups T1-T4 were 44 (1.19%), 21 (0.58%), 39 (1.19%) and 45 (1.05%). The commonest abnormality was stumpy tail, with the highest value in T4 31 out of 4280 total cells counted. There was no significant difference among the groups ($P>0.05$).

The total sperm cell abnormalities uncounted in groups T1-T4 were 302 (8.15%), 218 (6.68%) 373 (11.49%) and 386 (9.02%).

Discussion

The primary abnormalities observed in this study indicate a disturbance in the spermatogenic process in the animal, as reported by OKE OLUSOLA et al. (2003) and OYEYEMI et al. (2002). It was also observed that feeding of soybean meal to group T1 animals, and meat offal to groups T2 and T3 animals did not affect the spermatogenic process to the extent of causing a significant increase in the number or percentage of primary abnormalities. This is because the value of abnormalities observed in this study was far lower than the normal range of 10% reported by REECE (1997). This indicates that the fertility of bucks will not be affected if fed on any of the feeds.

The causes of secondary abnormality which ocurred more than primary and tertiary abnormalities are changes taking place during storage, maturation and transportation of sperm cells in the epididymis or beyond (OYEYEMI et al., 2000).

The tertiary abnormalities observed in this study must have resulted from improper handling or processing of semen samples and/or smear and adverse influences on collected semen such as contamination with urine or water. This is in agreement with the report of HAFEZ (1993).

The fertility of the animals in this study will not be impaired, since total percentage of abnormality in the four groups T1-T4 is far below that stipulated for good reproductive potential.

It can be concluded that the use of soybean meal, meat offal, or a combination of the two as a source of protein in animal feed, have no negative effects on the morphological characteristic of West African dwarf buck sperm cells under tropical conditions.

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Received: 29 November 2004
Accepted: 2 March 2006

OYEYEMI, M. O., V. O. ADETUNJI, O. OLUBUKOLA: Utjecaj različitih udjela mesnih otpadaka i sojine sačme na morfološke značajke spermiograma u zapadnoafričkih patuljastih jaraca. Vet. arhiv 76, 159-165, 2006.

SAŽETAK

Dvadeset zdravih zapadnoafričkih patuljastih jaraca u dobi između 18 i 24 mjeseca, težine 13-15 kg podijeljeni su nasumce u 4 skupine (T1 - T4). Pokus je trajao 14 tjedana, a hranjeni su mješavinom koja je sadržavala različite koncentracije mesnih otpadaka i sojine sačme. Skupina T1 dobivala je samo sojinu sačmu, skupina T2 dobivala je mješavinu sastavljenu od 35% mesnih otpadaka i 65% sojine sačme, skupina T3 hranjena je mješavinom sa 70% mesnih otpadaka i 30% sojine sačme, a skupina T4 dobivala je samo brašno mesnih otpadaka. Sjeme je uzimano u razmacima od jednog tjedna. Analizirane su morfološke značajke i koncentracija sperme. Primarne, sekundarne i tercijarne abnormalnosti bile su prisutne u sve četiri skupine. Najčešće su ustanovljene sekundarne abnormalnosti. Kovrčavi rep bila je najčešća pojava u svih skupina, a u skupini T4 ustanovljen je njihov najveći broj i postotak. Nije utvrđena značajna razlika između skupina ($P<0,05$) za abnormalnost kovrčavog repa. Također, nije bilo značajne razlike ($P<0,05$) između skupina za ukupne sekundarne abnormalnosti promatrane u pokusu. Primarne abnormalnosti rudimentiranog repa najčešće su ustanovljene u skupini T3, iako nije bilo značajne razlike ($P<0,05$) u njihovu ukupnom broju od prisutnih primarnih abnormalnosti. Tercijarne abnormalnosti kratkog i debelog repa ustanovljene su u svim skupinama. Nije bilo značajne razlike ($P<0,05$) u ukupnom broju tercijarnih abnormalnosti. Ukupan postotak primarnih, sekundarnih i tercijarnih abnormalnosti za skupine T1-T4 iznosio je 8,15%, 6,63%, 11,47% i 9,02%. Vrijednosti dobivene za svaku skupinu bile su manje od 20% abnormalnosti koje su preporučene za potrebnu učinkovitost. Može se zaključiti da sojina sačma i brašno mesnih otpadaka kao izvori proteina za životinje nisu imali negativan učinak na morfološke značajke spermija i rasplodne sposobnosti u zapadnoafričkih patuljastih jarčeva.

Ključne riječi: mesno brašno, sojina sačma, spermiogram jaraca