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Spermiogram and Changes in Body Parameters of West African Dwarf Bucks Fed with Dussa-poultry Waste Combination

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Abstract: The effects of 50% substitution of Guinea corn offal (Dussa) with treated poultry waste in the feeds on the spermiogram, live body weight, scrotal circumference (SC), scrotal length (SL), crown rump length (CRL), topline (TL), shoulder height (SH) and chest circumference (CC) were investigated using ten apparently healthy WAD bucks between 12-24 months old and weighing 7.2-13.6kg. Bucks were fed at the rate of 0.5kg/head/day with the experimental ration in two experiments. In experiment 1, 100% guinea corn offal was used while 50% poultry waste and 50% guinea corn offal was used in experiment 2. The poultry waste used in the study was prepared through ´the deep stacking´ method. Each of the experiments lasted for 4 weeks. Bucks were allowed unrestricted access to fresh water throughout the study, but denied of contacts with does. Results showed that the percentage spermatozoa motility (83.00±3.45 to 82.50±0.58) and percentage livability (94.03±3.20 to 93.90±0.35) decreased significantly ($P<0.05$). Differences in the mean values between the periods of administration of 100% guinea corn offal and 50% substitution to the bucks for semen volume (0.15±0.06 and 0.24±0.05) ml, spermatozoa concentration (107.03 ±4.36 and 107.60±0.92) x 10^9 and percentage morphological abnormalities (87.45±0.06 and 89.97±0.13)% respectively were significant ($P<0.05$). There were also significant ($P<0.05$) reduction in live body weight, topline (TL) and chest circumference (CC). There were however significant ($P<0.05$) increases in crown rump length (CRL), shoulder height (SH), scrotal circumference (SC) and scrotal length (SL). From the findings in this study, we concluded that the use of poultry waste as a component of feeds may appear to promote growth, but is harmful on spermatozoa and hence requires caution.

Key words: Spermiogram · Body parameters · Poultry waste · Dussa

INTRODUCTION

The productivity of livestock in the West African sub-region, especially Nigeria has been very low to the extent that malnutrition has increasingly taken its toll on people in the sub-region. Some of the reasons for the low productivity include low genetic potential of indigenous breeds, a variety of environmental factors such as high ambient temperature, humidity, diseases, parasites, poor husbandry methods and shortage of adequate feeding and water. Perhaps all species of livestock husbandry systems in Nigeria are faced with the challenge of having access to adequate feeds and water all year round. The effect of this is that in most livestock farms, spending on feeds alone often amount to over 70% of the total spending yearly. With the peculiarity of our indigenous breeds, a way of optimizing their performance will be through the provision of balanced nutrition in terms of quality and quantity at all times. To experience a breakthrough in any agricultural/livestock venture therefore, research must be geared towards finding cheaper, yet nutritious and more readily available feed materials that can partly or totally replace the conventional feedstuff materials or the recycling of certain wastes that may be useful in other biological pathways. One of such wastes is poultry excreta/droppings. The crude protein content of poultry excreta was reported to vary between 14 and 30% in dry matter basis [1]. The chemical analysis of the excreta also showed that it is composed of about 64% nitrogen in the form of non-protein nitrogen [2]. The observation on the nutrient value of poultry waste has prompted its recommendation by researchers that it could be utilized by ruminants for the conversion of its nutrients into animal products for

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human consumption [3-4]. Earlier, it has been reported that the nitrogen content of poultry excreta can be utilized ten times more efficiently when recycled through ruminants as feed [5]. Its inclusion in cattle feeds was approved in the early 1970s [6]. It has been reported that the inclusion of broiler litter as roughage for growing Korean beef cattle did not only result into better performance but improved the production economy [7]. Similarly, it has been observed that poultry litter could replace up to 32% of maize-soyabean quantity in rabbit diets without any harmful effects on growth [8]. There are abundant literature describing the preparation and utilization of poultry waste as feeds for ruminants and stressing the potential of the practice as having the capacity to improve livestock performance and growth [1, 7, 9,]. However, none of these studies have investigated the possible effects of the inclusion of poultry waste on reproductive indices of the beneficiary animals. Also, due to the constraint in livestock production occasioned, especially by the long dry season in the tropics and the unavoidable need to investigate alternate sources of feeds to cut down on cost of production, the present study was designed to investigate some reproductive implications and effects on body parameters of 50% substitution of dussa with poultry waste in feeding adult West African dwarf goats (bucks).

MATERIALS AND METHODS

Ten apparently healthy West African dwarf bucks between 12-24 months old and weighing 10.5-13.6kg which had been kept on the University farm for more than six months were involved in the study. Bucks were used to perform two experiments. In experiment I, 5 bucks which were fed on 100% dussa, while in experiment II, 5 bucks were fed on a mixture of dussa and treated poultry waste (1:1). During the study which lasted 4 weeks, bucks in both experiment I and II were fed at the rate of 0.5kg/head with the concentrate. The dussa (guinea corn) used was purchased from a local supplier and proximate analysis showed that it contained 14.52%CP, 4% moisture and 28.18% nitrogen free extracts. The poultry waste used in the study consisted of broiler litter which was subjected to "deep stacking" using the method described earlier [10]. Bucks were denied access to does throughout the study. Weekly changes in spermiogram, body weight and body parameters such as crown rump length (CRL), shoulder height (SH), topline (TL), chest circumference (CC), scrotal circumference (SC) and scrotal length (SL) were recorded. Semen was collected through electroejaculation method [11] from the bucks and analysis was carried out using standard methods described earlier [12]. Morphological abnormalities of spermatozoa were equally evaluated according to methods described earlier [13]. Body weight was evaluated through the use of a hanging scale, while body parameters were estimated with the aid of a graduated tape. Data collected was evaluated using the student-t test statistic (SAS Inc. North Carolina USA).

RESULT AND DISCUSSION

Table 1 shows the results of spermiogram for the two experiments. The mean values for spermatozoa motility and livability decreased significantly ($P<0.05$) from 83.00±3.45 and 94.03±3.20 (with 100% dussa) to 82.50±0.58 and 93.90±0.35 (dussa:poultry waste) respectively. There were also significant ($P<0.05$) increase in the mean values for semen volume (0.15±0.06 to 0.24±0.05) ml, spermatozoa concentration (107.03±4.36 to 107.60±0.92) $x10^9$ and percentage spermatozoa morphological abnormalities (87.45±0.06 to 89.97±0.13) when the bucks were fed with 100% dussa than when they were fed with dussa:poultry waste in equal ratio.

Table 2 shows the result of other body parameters between the groups of bucks in the study. Between the two experiments (i.e. 100% dussa and dussa: poultry waste mixture) of bucks, there were significant ($P<0.05$) reduction in live body weight (11.68±0.30 to 11.27±0.34),

Table 1: Mean values ±S.D for spermiogram during the study

Parameter (s)	Dussa (100%)	Dussa:poultry waste (1:1)	P-value
Motility (%)	83.00±3.45	82.50±0.58	P<0.05
Livability (%)	94.03±3.20	93.90±0.35	P<0.05
Concentration ($x10^9$)	107.03±4.36	107.60±0.92	P<0.05
Morphological abnormality (%)	87.45±0.06	89.97±0.13	P<0.05
Semen volume (mls)	0.15±0.06	0.24±0.05	P<0.05

Table 2: Mean values ±S.D for body parameters of bucks during the study

Parameter (s)	Dussa (100%)	Dussa:poultry waste (1:1)	P-value
Live body weight (kg)	11.68±0.30	11.27±0.34	P<0.05
Topline (cms)	29.34±1.34	28.62±0.94	P<0.05
Chest circumference (cms)	53.31±0.38	51.70±0.28	P<0.05
Crown rump length (cms)	63.90±1.85	64.34±1.58	P<0.05
Shoulder height (cms)	41.95±1.35	42.34±0.19	P<0.05
Scrotal circumference (cms)	15.83±0.89	17.17±0.12	P<0.05
Scrotal length (cms)	7.61±0.26	9.01±0.06	P<0.05

TL (29.34±1.34 to 28.62±0.94) and CC (53.31±0.38 to 51.70±0.28). There were also significant (P<0.05) increase in CRL (63.90±1.85 to 64.34±1.58), SH (41.95±1.35 to 42.34±0.19), SC (15.38±0.89 to 17.17±0.12) and SL (7.61±0.26 to 9.01±0.06).

The semen parameters investigated in the study occupy positions of relevance in andrological studies and are indispensable in breeding soundness evaluation for estimation of potential fertility. The singular importance of the spermatozoon is to fertilize an ovum either *in-vivo* or *in-vitro*. The present study showed that the incorporation of 50% poultry waste in dussa significantly (P<0.05) increased the spermatozoa concentration and volume, but had adverse effect on the motility and livability of the spermatozoa. These observations require careful interpretation. Increase in semen volume and spermatozoa concentration are desirable as these though not single handedly, may imply that more female animals will be covered when such ejaculate samples are extended. However, the harmful effect observed on motility and livability is a limitation to this goal. Spermatozoa migration is a major task which the sperm cell must perform especially under natural mating and this depends greatly on the motile capacity and livability of the spermatozoon [14]. Since the damaging effect of infectious and toxic agents on the testicle is the production of sub fertile spermatozoa [15], the observation on the spermiogram in this study suggested that poultry waste may affect testicular function and as such reduced the quality of the ejaculate. Morphological abnormality of spermatozoa is an equally important ejaculate parameter which reflects the degree of maturation and normality of spermatozoa. Increase in the percentage of abnormal sperm cells has been associated with testicular affections such as degeneration [16]. The study therefore suggested that poultry waste may have caused some damaging effect on the testicles. Results of the study also showed that 50% inclusion of poultry waste in dussa as feeds to goats caused significant (P<0.05) increase in CRL, SH, SC and SL. However, significant (P<0.05) reduction were observed for live body weight, TL and CC. It is important to observe that all the body parameters investigated in the study except live body weight are determinants of live body weight. Hence, the observation again required careful interpretation. Within the normal limit for each species, breed and sex, live body weight is a determinant of the quality of life and the reproductive performance of the animal. Hene, supplementary feeding was reported to have positive effect on growth and fertility of beef heifers grazing natural pasture [17]. Any factor (s) that will reduce body weight, other than in obese patients, are undesirable. It has been reported that severe weight loss is associated with lower conception rates and longer calving interval in the cow [18].

In conclusion, the findings of the study did not indicate in any way that the use of poultry waste in livestock feeds should be stopped, but suggested that because of its reduction in ejaculate quality and live body weight, caution should be exercised as its unchecked use may have damaging effect on reproductive performance.

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