Ghana Journal of Science, Technology and Development
Vol. 5, Issue 1. November 2017
Journal homepage: www.gjstd.org
ISSN: 2343-6727

Reproductive performance of West African Dwarf goats under guinea Savannah conditions

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ABSTRACT

There is a general paucity of information on the reproductive performance of small ruminants in Sub-Saharan Africa, particularly, goats. A study was carried out at the National Goat Breeding Station to document the reproductive performance of West African dwarf goats. Data was obtained from the breeding records of 903 West African dwarf nanny goats collected between 2004-2013, during 14 breeding seasons for the estimation of conception rate, kidding rate and kidding percentage. The effects of season of breeding and parity of the doe on these reproductive performance parameters were determined using t-test (2 tailed). The results showed that the average conception rate, kidding rate and kidding percentage were 87.1%, 142.9% and 120.1%, respectively. For most (85.7%) of the breeding seasons studied, conception rate ranged from 60%-90%, while the remaining had conception rate of between 60-100%. Prolificacy and fecundity rates in the flock of West African dwarf goats for most of the seasons studied ranged from 110%-160% and 91%-130%, respectively. Season of breeding and parity of the doe had no significant effect (P>0.05) on conception rate, kidding rate and kidding percentage. Excepting fecundity rate, the goats used in the present study were found to be generally higher in reproductive performance than the observations in other studies.

Keywords: *Conception; Prolificacy; Fecundity; Season; Djallonké Doe; Parity*

INTRODUCTION

Livestock, especially, small ruminants are important to smallholders or rural farmers (Karbo *et al.,* 1999) and to the nation at large (CSIR and ISNAR, 1988). They are considered as poor man's cow or bank due to their ability to provide sufficient nutritious meat and milk, skin and fiber for the small holder's use, with perhaps little left for sale. These associations with poor or small farmers have often meant that goats have been taken for granted, as those involved in research or development in both tropical and temperate countries have neglected the farm animal. Hence the importance of the goat to farming is likely to remain understated and its potential underdeveloped (Steele, l996).

Though goats are kept in small numbers on small farms in the developing countries, they are of great economic importance to these

countries (Peacock, 1992). However, animal breeders in conjunction with the government are making conscious efforts to improve on the reproductive performance of these animals as one of the possible means of helping meet food supply, which is insufficient for the rising population (Bishop and Woolliams, 2004). In developing countries, the strong increase in demand for livestock products must be met in circumstances where infrastructure is often minimal. There are limitations on inputs, and environment places demands on management and on the adaptive fitness of the livestock. In both situations, solutions to these problems must be sustainable and appropriate, yet be technically feasible, cost effective and publicly acceptable (Bishop and Woolliams, 2004).

Olayiwole and Adu (1989) reported that good selection is impossible in flocks with inadequate or non-existent records, as is the case in many developing countries. Wilson (1989) and Kiwawa (1992) suggested that selection should improve reproductive and growth performance, while conserving the characteristics that adopt tropical goat to their environment. Very little attention has been paid to the indigenous tropical breeds (Devendra and Burns, 1983), particularly, goats, despite their adaptability to the tropical environment. The objective of this work, therefore, was to document the reproductive performance of West African dwarf goats (WAD), with the hope that this will serve as a baseline data for further improvements. The study was specifically designed to look at the effects of season (climatic season) and parity on conception, prolificacy and fecundity rates in West African dwarf goats.

MATERIALS AND METHODS

Experimental site

The study was conducted at the National Goat Breeding Station of the Animal Production Directorate, Ministry of Food and Agriculture, Kintampo. The area is located between longitude 01° 03 'W and latitude 08° 03 'N and altitude 373.0 m above sea level (Source: Meteorological Service Department, 2016). Kintampo experiences a single rainy season which starts from May to October, with annual rainfall averaging between 1000 mm-1200 mm. The dry season starts from November to April. Temperatures range between 20 °C -36 °C. The vegetation of the area is semi-deciduous forest type. It is woody savannah characterized by scattered shrubs, baobab, dawadawa and sheanut trees. (Source: Meteorological Service Department, 2016).

System of management

The farm has eleven paddocks in which the animals are grazed on rotational basis. Some of the legumes and grasses planted in these paddocks include Giant star grass, *Centrosema,* Guinea grass, Pigeon pea and *Stylosanthes.* Animals go out to graze at about 8:30 am and return at about 4:30 pm each day in the wet season, while *ad-lib* grazing is allowed in the dry season. Animals are also given supplementary feed in the form of cassava peels and concentrates (mixture of maize, Soya beans and wheat bran). Deworming is done every two months in the rainy season, and twice during the entire dry season. Animals are dipped at the onset of the rainy season, when some of the animals start to limp and when ticks are spotted on some animals. Sick animals are usually culled and treated. Indelible ink is used to identity kids from day one to one month of age and then ear tagged thereafter. Management practices such as dehorning, castration and record keeping are also carried out. The kids are weighed within twelve hours of birth and thereafter once every month. Records are kept on birth, mortality and growth rate of kids.

Houses are mainly stalls with concrete floor that gently slopes with a wall of about 0.5-l.0 meter high. Animals are grouped according to their ages. Dams and kids are kept in sheds until the

time of mating, while adult breeding does are in the general flock shed. The breeding males are also kept in separate pen throughout their lives. Maternity pen which is drought-free with concrete floor is provided for pregnant does. The breeding station is one of six designated for use as open nuclear breeding station for goat improvement, and improves upon strains and sells out for multiplication. Animals are bred seasonally from September to October, and again in March. Bucks join the does during a mating period of forty-five days every eight months to control mating. A breeding ratio of l male to 30 females is employed.

Data collection

The data used was obtained from the breeding records of 903 West African Dwarf goats, collected between 2004-2013, during 14 breeding seasons. Seven of the breeding seasons coincided with the wet season while the other 7 coincided with the dry season. Four hundred and seventeen (417) of the animals were primiparous while 486 were multiparous. The reproductive performance parameters studied were estimated using an approach previously used by Ngere and Aboagye (1981), as follows:

(**i) Conception rate (Fertility rate)**: This was estimated as the percentage of does that conceived to those mated per breeding season (Number of does conceived/Number of does mated *100**)**.

(ii) Kidding rate (Prolificacy rate): This was estimated as the percentage of kids born to kidding does per breeding season (Number of kids born/Number of does kidding *100**)**.

(iii) Kidding percentage (Fecundity rate): This was estimated as the percentage of kids born to the number of does exposed to males of reproductive age per breeding season (Number of kids born/Number of does exposed to males*100**)**.

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(iv) Other parameters recorded: The other parameters recorded were parity of the doe and season of birth. Animals were classified into 2 parity groups, namely, primiparous (one gestation and/or parturition) and multiparous (2 or more gestation and/or parturitions). Season of birth was also categorised into dry and wet seasons.

Statistical analysis

T-test (two tailed) of the Lawes Agricultural Trust (1996) statistical package was used to ascertain the effects of season and parity on the aforementioned reproductive performance parameters. All comparisons were done at 5% level of significance.

RESULTS

The fertility, prolificacy and fecundity rates in West African Dwarf does in the present study were 87.1%, 142.9% and 120.1%, respectively (Table 1).

Table 1: The reproductive performance of West African Dwarf nanny goats

Parameter (%)	Mean±Standard error
Conception rate	87.1±2.2
Kidding rate	142.9±7.4
Kidding percentage	120±6.4

Number of breeding seasons=14, Number of Animals = 903

The results obtained from this study and shown in Table 2 revealed that season of birth and parity of the dam did not significantly influence (P>0.05) fertility, prolificacy and fecundity rates in West African Dwarf goats. However, multiparous does and those bred in the dry season had slightly higher conception, prolificacy and fecundity rates than primiparous does and those bred in the wet season, respectively.

From the results of the study, conception rate of between 60-90% was recorded during most (85.7%) of the breeding seasons studied, while rates of between 91-100% were observed during the remaining breeding seasons (Fig. 1). Prolificacy rates ranging from 110-170% were recorded during most (92.8%) of the breeding seasons, while only 7.2% of the breeding seasons had higher range of between 211-220% (Fig 2). For most (85.7%) of the breeding seasons, fecundity rates in the flock of West African Dwarf goats studied ranged from 90-130%, while the remaining (14.2%) of the breeding seasons recorded fecundity rates of between 131% and 180% (Fig. 3).

Table 2: Effects of parity and season of breeding on reproductive performance of West African Dwarf nanny goats
SEM: Standard error of mean

Categories of Animals	No. of Animals	Reproductive performance parameters (Mean±SEM) Conception rate (Fertility rate) (%)	Kidding rate (Prolificacy rate) (%)	Kidding percentage (Fecundity rate) (%)
PARITY				
Primiparous	417	40.71±3.99	135.7±7.47	56.89±7.71
Multiparous	486	48.57±3.76	147.9±11.35	64.36±3.99
SEASON				
Dry	290	90.0±3.09	145.7±13.60	129.0±11.74
Wet	613	84.29±2.97	140.0±7.24	111.2±3.81

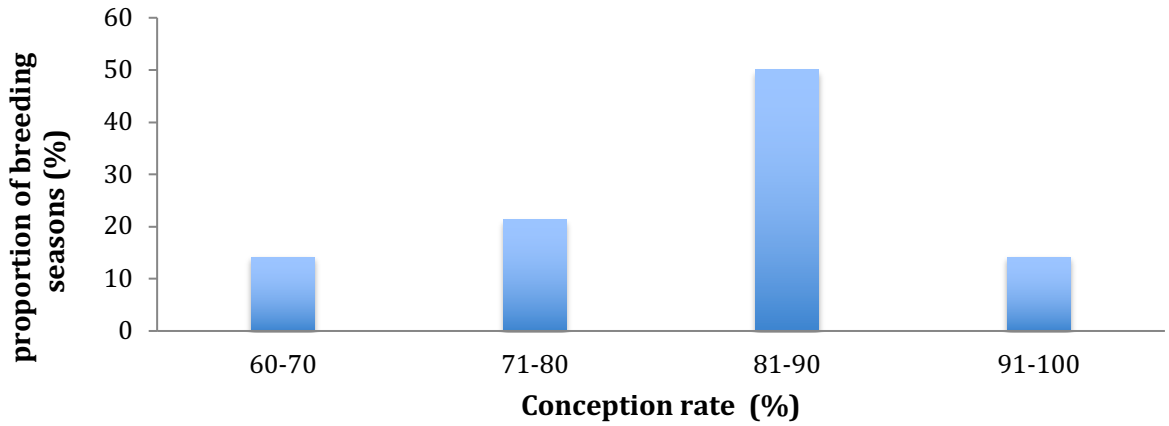

Figure 1: Distribution of conception rates in a flock of West African Dwarf nanny goats

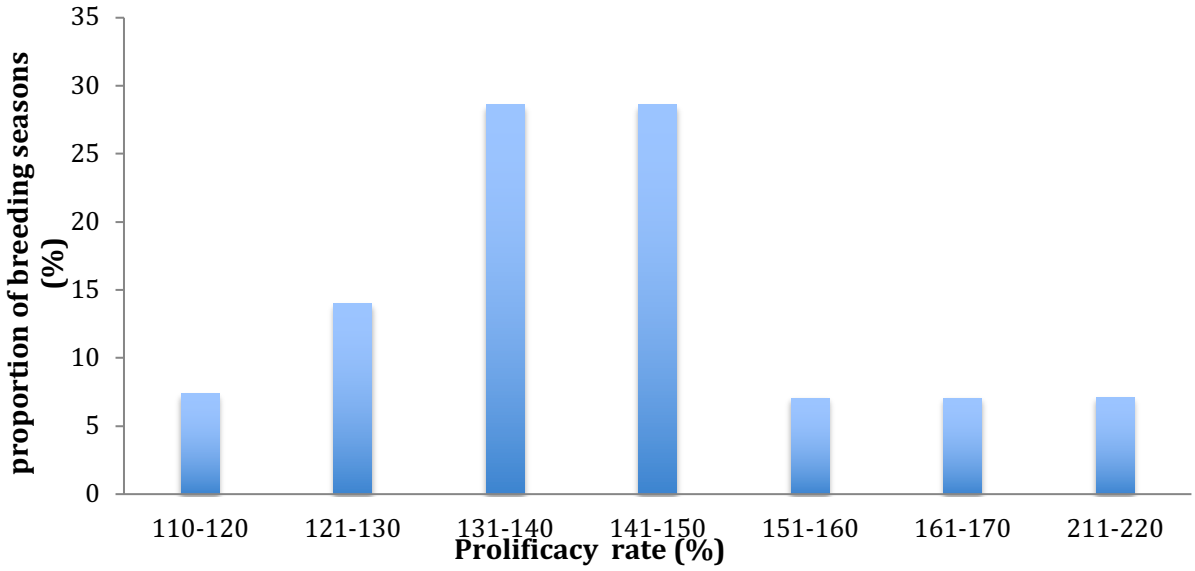

Figure 2: Distribution of **Prolificacy** rates in a flock of West African Dwarf nanny goats

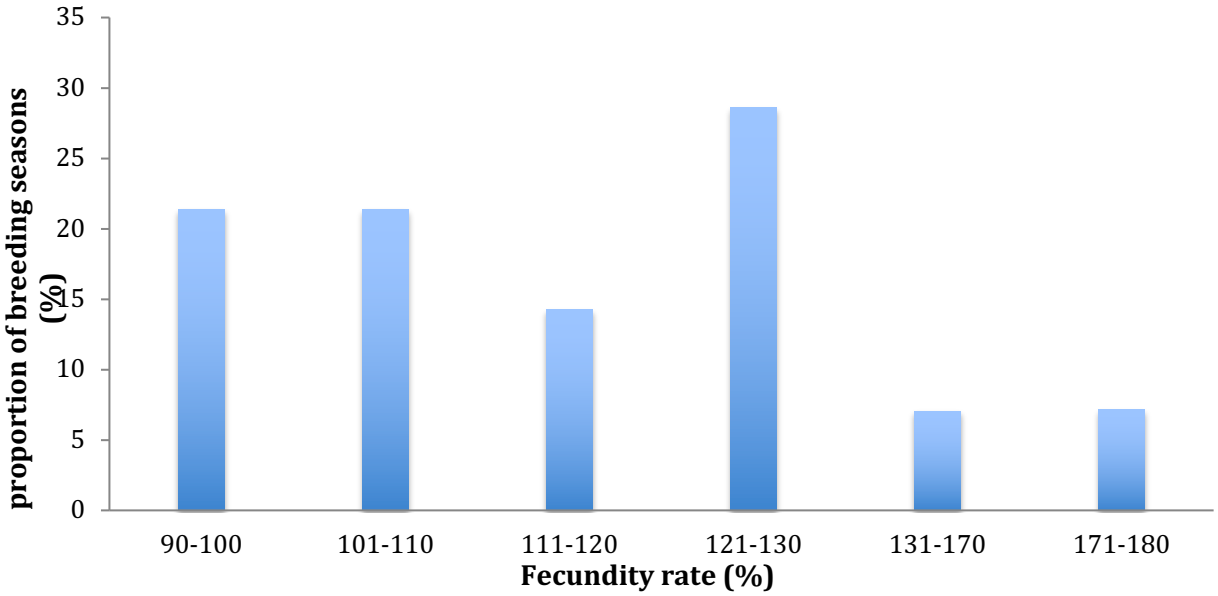

Figure 3: Distribution of **fecundity** rates in a flock of West African Dwarf nanny goats

DISCUSSION

Fertility rate observed in the present study is similar to the rate (89.3%) reported by Azévedo *et al.* (1993) under natural conditions and Charry *et al.* (1992; 88.8%, 90% and 93.4%) under different management systems. These are, however, higher than the rates reported by Belewu *et al.* (2006) (33.5% and 60%) and Ngere and Aboagye (1981) (72% and 79%) in West African Dwarf and Nungua Black Head ewes, respectively. The fertility rates of 93% reported by Kirschke and Simon (1999) in the dry season is similar to the 90% observed in the present study. Peacock (1984), however, observed lower fertility rates (77%

and 83%) in the rainy season under different management systems. Even though no significant difference was found in fertility rates between wet and dry seasons in the present study, the dry season figure was slightly higher. The high fertility rates observed in both seasons is attributable to the high level of concentrate supplementation during both seasons on the station (Guessous *et al.,* 1989), even though Rhind *et al.* (1985) reported that level of feeding had no effect on fertility rate. No difference was also found in fertility rate between primiparous and multiparous does.

The prolificacy rate observed in the present study is similar to the 150% observed by Defty and Handlos (1982). In contrast to these findings, Buadu (1972), Dettmers *et al*. (1976), Amegee (1984) and Tuah and Bash (1985) reported higher rates of 184%, 172% 169% and 185%, respectively, in goats. The rates reported by Amegee (1984) in sheep, is comparable to those observed in the present study. The authors reported 148.4% and 145.5% in West African Dwarf and Vogan sheep, respectively. This is also in agreement with the 152%, 144% and 151% observed by Van Vlaenderen (1983), Upton (1985) and Ngere and Aboagye (1981), respectively. Lower rates of l02%, 112% and 114.2% were observed under different management systems by Charry *et al.* (1992). No significant influence of season was found on prolificacy rate in the flock of West African dwarf goats studied. In contrast, Hambolu and Ojo (1985) reported a significantly higher prolificacy rates in the dry than the wet season, and attributed their observation to the fact that goats are able to convert any available leaves and dry forages into useful nutrients during the dry season. Similar results were obtained in sheep by other workers (Salia, 1990; Odubote, 1992; Buadu and Osafo, 1994; Yapi-Gnaore *et al.*, 1997). The insignificant effect of parity observed on prolificacy rates in the present study is dissimilar to the observations of Kirschke and Simon (1999), and Devendra and Bums (1983) in goats. Both authors observed significantly higher prolificacy rates in multiparous than primiparous does. Even though the multiparous does in the present study did slightly better than primiparous does, the difference was not statistically significant.

The fecundity rate observed in this study is far lower than the 293%, 260%, and 267% observed by Buadu (1972), Vohradsky and Sada (1973) and Otchere and Nimo (1976), respectively, in goats. This is, however, higher than the 52.5%, 65% and 75.5% observed by Acharya (1978) in Marweri, Mehsana and Kutchi goats, respectively. In sheep, Defty and Handlos (1982) reported a fecundity rate of 90%. Similar rates were observed by Acharya (1978) in different breeds. Higher rates of 160% and 163% were, however, reported by Charry *et al.* (1992) and Van Vlaenderen (1984). Kirschke and Simon (1999) observed a higher fecundity rate in the dry than wet season. This result disagrees with the observations made in the present study. In agreement with the results of the present study, Kirschke and Simon (1999) found similar fecundity rates in primiparous and multiparous does. Several authors (Acharya, 1978; David and Geoff 1994; Delgadillo and Malpaux, 1996) have reported positive influence of better management practices on fecundity rate. The insignificant effect of parity on fecundity rate observed in the present study is, therefore, attributable to the good management practices at the breeding station.

CONCLUSION

Season of breeding and parity of the doe had no effect on reproductive performance of West African Dwarf nanny goats. Excepting fecundity rate, the goats used in the present study were found to be generally higher in reproductive performance than the

observations in other studies.

ACKNOWLEDGEMENTS

The author wishes to thank the Farm Manager and Staff of the National Goat Breeding Station of the Animal Production Directorate, Ministry of Food and Agriculture, Kintampo, for allowing the use of their facility for this work.

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