Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.5, No.12, 2015

Lambing Interval in Zero-Weaned West African Dwarf (WAD) Ewes Reared Intensively with Rams in a Humid Tropical Environment

Lawrence BRATTE
Department of Animal Science, Delta State University, Asaba Campus, Asaba, Nigeria
E-mail of the corresponding author: lbratte@yahoo.com

Abstract
This experiment was performed to determine lambing interval in a flock of West African Dwarf ewes run continuously with rams in complete confinement, in order to take advantage of "ram effect", but without weaning (zero weaning) their lambs. Twenty-four (24) mature West African Dwarf ewes aged 18 to 24 months were run continuously with three (3) mature rams of the same breed and age range for two years, and managed in complete confinement. They were fed fresh, cut forages (*Panicum maximum, Gliricidia sepium and Leucaena leucocephala*) supplemented with a concentrate diet of Brewers' Dried Grains (BDG), rice bran, palm kernel cake (PKC) and a vitamin/mineral premix. All 24 ewes (100%) lambed during the experimental period, and produced a total of 72 lambs in 63 lambing, giving a lambing rate of 114.30%. Average litter size (or prolificacy) was 1.14 lambs. Single births made up about 84% of all births, while twin births were about 16%. There were no triplets. The number of lambs born per ewe per year (fecundity) was approximately 1.50. Mean lambing interval was 242.93 ± 10.04 days (range, 174 to 291 days), and was slightly longer in male lambs (248.75 ± 11.72 days) compared with female lambs (236.29 ± 17.52 days), and in twin lambs (254.33 ± 17.39 days) than in single lambs (235.33 ± 12.25 days), although the differences were not significant (P>0.05). Mean postpartum interval to conception ranged from 27 days (once in only one ewe) to 144 days, and averaged 95.93 ± 10.03 days while the average re-breeding interval was 95.93 ± 10.03 days. Mean lamb birthweight was 1.90 ± 0.10kg. Mean live-weight gain to lambing was 4.88 ± 0.39kg, and higher, though non-significantly (P>0.05), in male lambs and twin births than in female and single lambs respectively. It was concluded that zero-weaned WAD ewes kept in complete confinement, and run continuously with rams are more likely to achieve three lamb crops in two years.
Keywords: West African Dwarf ewes, lambing interval, lambs, rams, zero-weaning

1. Introduction

The West African Dwarf (WAD) sheep are commonly found in the tropical forest regions of West Africa (Adu & Ngere 1979; Sowande *et al.* 2007). The sheep have developed small body sizes in response to the harsh climatic conditions, nutritionally poor pastures and high incidence of diseases and parasites characteristic of the region (Tizikara *et al*. 1985; Ademosun 1990). They are commonly found in rural homesteads where they are predominantly managed extensively with minimum inputs by way of feed, shelter, veterinary care and general management. As a result, their productivity, in terms of meat and milk yields, is low. Nevertheless, they contribute substantially to the socio-economic wellbeing of their keepers by providing them with meat, milk, skin and income. They also have the advantage of being trypanotolerant.

Unlike sheep from the temperate environments that are seasonally anoestrous, the WAD sheep breeds all year round. Consequently, increasing the number of lambs born and weaned per ewe per year either by increasing ovulation rate and the incidence of multiple births among ewes, or by reducing the interval between successive lambing (Chiboka 1986; Casellas & Bach 2011) in order to achieve more lamb crops per year should substantially increase productivity of the WAD sheep.

With a gestation length of 147 to 152 days (Osuagwuh *et al*. 1980) (average, 150 days), it should technically be possible to breed them to give two lamb crops per year, provided resumption of ovarian activity and successful rebreeding can occur in about 33 days (Osinowo 2000) or less postpartum. In practice, however, return to oestrus, and pregnancy are determined by the amount of time required for the uterus to return to its pre-gestation state (uterine involution) and for the ovaries to become active again (Ungerfeld & Sanchez-Davila 2012). A recent assertion by Hunter (2010) that failure of ewes to conceive in less than a month post-partum is more a result of retained blood and cell debris in the uterus rather than lack of uterine involution suggests that the uterus actually regains its pre-gestation status in less than a month postpartum.

Suckling has been implicated in some farm animal species, including small ruminants, as a contributory factor in the prolongation of the postpartum duration to resumption of ovarian cyclicity (Morales-Terán *et al.* 2004; Arroyo *et al*. 2011).

Some other studies have provided evidence that exposure of previously isolated ewes to rams at some point during the postpartum or seasonal anoestrus could induce ovulation in sheep (Martin *et al*. 1986; Ungerfeld *et al*. 2002) and even mitigate the inhibitory effect of suckling on resumption of ovarian activity in ewes.

Ungerfeld and Sanchez-Davila (2012), for example, found no significant difference in percentages of ewes that came into oestrus or conceived between ewes whose lambs were weaned at approximately 27 days postpartum, and those whose lambs remained with them, after rams were introduced three days later.

Data on reproductive performance and lambing intervals of adult West African Dwarf ewes exposed continuously to rams, while at the same time receiving the opposing effect of the suckling stimulus, are virtually absent.

This experiment was therefore performed to ascertain lambing interval, over a two-year period, in a flock of WAD ewes run continuously with rams in complete confinement, without weaning (zero weaning) and without hormonal intervention, in a humid tropical environment.

2. Materials and Methods

Twenty-four (24) mature West African Dwarf ewes aged 18 to 24 months were run continuously with three (3) mature rams of the same breed and age range for two years, and managed in complete confinement in concrete floor pens with 1m high concrete walls.

They were fed fresh, cut forages (*Panicum maximum, Gliricidia sepium and Leucaena leucocephala*) supplemented with a concentrate feed made from Brewers' Dried Grains (BDG), rice bran, palm kernel cake (PKC) and a vitamin/mineral premix such that each adult animal received approximately 150g dry matter per kg metabolic weight per day. Cool, clean drinking water was provided *ad libitum.*

The animals were routinely dipped in a dip of Asuntol (Beyer, Germany) solution to control ecto-parasites in the flock, and dewormed at 4-monthly intervals with recommended doses of Systamex (Coopers Animal Health, UK).

Lambs born were allowed to remain with their dams without weaning (zero weaning) for the duration of this study. The following fertility traits were computed for the ewes:

Gestation rate (%) = No. of lambing x 100/Mated ewes
Lambing rate (%) = No. of lambs born x 100/No. of lambing
Litter size = No. of lambs born/No. of lambing
Single births (%) = Single births x 100/No. of lambing
Twin births (%) = Twin births x 100/No. of lambing
Lambs/ewe/year = (Lambs born/Mated ewes)/No. of Years

Data on lambing intervals, postpartum intervals to conception, lamb birth weights and ewe live-weight gains to lambing were subjected to a two-factor analysis of variance, with sex (male and female) and type of birth (single and twin) of lambs as factors, using the General Linear Model procedure of the SPSS (v 20) statistical package of 2011.

3. Results and Discussion

The fertility traits of the West African Dwarf ewes are presented in Table 1.

All 24 ewes (100%) lambed during the experimental period, and produced a total of 72 lambs in 63 lambing, giving a lambing rate of 114.30%. Average litter size (or prolificacy) was 1.14 lambs, and not too different from a value of 1.22 ± 0.01 lambs reported by Balogun *et al.* (1993). Single births made up about 84% of all births, while twin births were about 16%. There were no triplets. The number of lambs born per ewe per year (fecundity) was approximately 1.50.

Table 1: Fertility traits of the West African Dwarf ewes*

Fertility Traits	Value
Gestation Rate (%)	100
Lambing rate (%)	114.30
Litter size	1.14
Single Births (%)	84.13
Twin Births (%)	15.87
Number of Lambs/Ewe/Year	1.50

*No. of ewes = 24; No. of lambing = 63; No. of lambs = 72

Lambing performance of the West African Dwarf (WAD) ewes showing the mean (± SE) lambing intervals, postpartum intervals to conception, lamb birth weights and approximate ewe live-weight gain to lambing classified according to sex and type of birth of lambs are presented in Table 2.

Table 2: Summary of lambing performance of the West African Dwarf ewes

Parameters	Sex		Type of Birth		Overall
	Male	Female	Single	Twin	
Lambing Interval (days)	248.75 ± 11.72	236.29 ± 17.52	254.33 ± 17.39	235.33 ± 12.25	242.93 ± 10.04
Postpartum Interval to Conception (days)	101.75 ± 17.52	89.29 ±11.79	107.33 ±17.42	88.33 ± 12.22	95.93 ± 10.03
Lamb Birth Weight (kg)	1.96 ± 0.11	1.83 ± 0.20	2.09 ± 0.09[a]	1.58 ± 0.18[b]	1.90 ± 0.10
Gain to Lambing (kg)	5.16 ± 0.73	4.72 ± 0.43	4.43 ± 0.22	6.00 ± 1.15	4.88 ± 0.39

[a, b]: Means with different superscript within a row differ significantly (P<0.05)

The overall mean lambing interval obtained for the West African Dwarf ewes in this study was 242.93 ± 10.04 days (range, 174 to 291 days), and was similar to those earlier reported for the breed by Gbangboche *et al.* (2005) (242.6 ± 20.8days), Chiezey *et al.* (2008) (192-349 days) and by Fadare (2015) (228 - 248 days). Male lambs had a slightly longer mean lambing interval (248.75 ± 11.72 days) compared with female lambs (236.29 ± 17.52 days), while lambing interval for twin lambs (254.33 ± 17.39 days) was slightly longer than that obtained for single lambs (235.33 ± 12.25 days). Sex and type-of-birth differences were, however, not significant (P>0.05).
Mean postpartum interval to conception ranged from 27 days to 144 days, and averaged 95.93 ± 10.03 days. Steinbach (1980) had reported an interval of 22-106 days for WAD ewes whose lambs were not weaned. A postpartum interval to conception of 35 days or less is required to achieve two lamb crops per year in sheep (Osinowo, 2000). In this study, a 27-day postpartum interval to conception was recorded once in only one of the ewes, which is an indication that two lambing per year are indeed attainable in WAD sheep. However, the average re-breeding interval of 95.93 ± 10.03 days, and a mean fecundity of 1.50 lambs per ewe per year (Table 1) indicate that what is more likely for the breed under the conditions of continuous suckling and exposure to rams applied in this study is three lamb crops in two years. Removal or reduction of the suckling stimulus in combination with exposure to rams may further reduce this interval, as was successfully done by Somade (1987) who obtained a mean rebreeding interval of 26 days in 44% of WAD ewes (N = 50) when their lambs were prevented from suckling for 7.5 hours daily from 14 to 30 days postpartum, and by Morales-Terán *et al*. (2011) who significantly shortened postpartum interval to first ovulation in Pelibuey sheep in Mexico. However, in most of the tropics where livestock productivity is severely limited by resource deficits, application of early weaning and restricted suckling are unlikely to find widespread application in practical terms in the near future. This is because these techniques require the application of artificial rearing or fostering of affected lambs, with their attendant increase in expenditure on lamb nutrition, otherwise significant increases in morbidity and mortality of lambs may result.

In addition to suckling and the "ram effect", several other factors such as season, health status and nutrition of the dam are known to play some role in determining the postpartum interval to oestrus, and to conception in sheep (Ajala *et al.* 2008).

Mean lamb birthweight obtained in this study was 1.90 ± 0.10kg, and is similar to values reported for the breed by ILCA in 1979 (1.80kg), and Ososanya *et al*. (2007) (1.0 - 2.1kg), but lower than the average values of 2.15 ± 0.46kg reported by Odubote (1992) and 2.82, 3.43 and 2.77kg obtained by Fadare (2015) for black-, brown- and white-coloured WAD sheep respectively. Differences in location, season, nutrition, management practices and parity may account for these disparities. Birthweights were higher in male than in female lambs (P>0.05) while single lambs were significantly (P<0.05) heavier than twin lambs as was also reported by Odubote (1992).

Mean ewe live-weight gain to lambing was 4.88 ± 0.39kg, and higher, though non-significantly (P>0.05), in male lambs and twin births than in female and single lambs respectively (Table 2). Values obtained were similar to those reported in an earlier study by Ososanya *et al*. (2007) (4.1 ± 0.1 - 5.3 ± 0.2kg) for the WAD ewes in Ile-Ife, southwest Nigeria.

Interactions between sex and type of birth were not significant (P>0.05) for all the parameters measured.

4. Conclusion

The average re-breeding interval of 95.93 ± 10.03 days and a mean fecundity of 1.50 lambs per ewe per year obtained in this study indicate that running WAD ewes continuously with rams while at the same time allowing their lambs unrestricted access to suckling is more likely to yield three lamb crops in two years.

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