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Productivity of taggar goats as affected by sex of kids and litter size

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ABSTRACT

The experiment was conducted in Taggar goats to evaluate the effect of two different levels of protein and energy in ration on some reproductive and productive traits. Sixty two (62) kids of Taggar goats were used in this experiment. Animals were allocated to three feeding regimes in a complete randomizes design according to live body weight. The results indicated that supplemented does secured higher litter size 1.50 and 1.33 compared with control group 1.2. Where kidding rate was high in supplemented groups 100% compared with control group 93.8%.Body weight was heavier at time of kidding and time at weaning for supplemented does compared with control does. These results indicated that supplementation reduced body weight losses through lactation period. The kidding interval for the supplemented does was shorter 247.81±8.38 and 242.60±7.88 days for does in groups B and C respectively compared with does in control group 288.94±6.84 days. Similar the service period had been reduced in supplemented does compared with control does, the respective values were 74.32±4.96, 83.46±4.67 and 93.08±4.22 days for groups B, C and A respectively. The results of milk analysis indicated that supplemented does produced higher protein, lactose and total solid content whereby the fat content was

higher in control does. The supplementation which given to does had reduced the number of aborted and abortion and mortality rates compared with the unsupplemented does. In conclusion the investigated environmental factors showed an impact on both reproductive and productive traits of the Taggar goats under the rangeland farming system.

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1. Introduction

Taggar goat is meat goat, valuable livestock in South Kordofan state, adapted to certain areas and is indispensable for the local people (Bushara and Abu Nikhiala 2012). The goat is being recognized as a significant food source, because doing can convert feed dry matter into the milk as efficiently as other ruminants. The population of goat in Sudan was estimated to be 42 million (M.A.R, 2007). More than 95% goats are being kept by the farmers living in the rural areas and goat keeping becomes an accessory source of income to the landless peasants in the rural community. Many of the landless and marginal farmers own 1-5 goats and contribute economically to the subsistence farmers in mixed farming systems.

The major factor influencing the reproductive performance is the body weight of the doe .It is generally considered that does may be mated when they reached 50% of their adult body weight, and this weight can be attained at varying ages according to diet composition (Walkdem-Brown and Bocquier, 2000).

The growth traits are important factors influencing profitability in any meat producing enterprise. Rapid growth during the early period can minimize the cost of rearing and thus provide more profit to the farmer. The birth weight and early growth rate of animals are determined not only by genetic potential but also by maternal and environmental factors (Mandal et al., 2006). Body weights and growth rates in pre-weaning are often considered as an early indicator of the late growth and economic benefit and can effect body weight at puberty and at first kidding (Portolano et al., 2002; Hanford et al., 2006). The type of birth (single or multiple) is considered as one of the most important factors influencing birth weight and sequences growth rate in goats (Das et al, 1996; Kosum et al, 2004). The present experiment was designed to study the effects of sex of kids and litter size on birth weight and body weight at weaning and study the effects litter size on body weight and age at puberty and 1st kidding on Taggar goat performance in western Sudan.

2. Materials and methods:

This study were conducted in Dalanj area (longitudes 12.02° N, Latitudes 29.39°E) Southern Kordofan state. The mean monthly temperature ranged from 25.8 C° in July to 31.3 C° in April. The mean maximum is about 39 C° in the three months prior the rainy season with peak temperature in May. The mean minimum Temperature varied between 17 C° in January to more than 20 C° at the onset of the rains in May. Annual rainfall of a range 500-800 mm, with peak rain in August. The relative humidity of 35% rose to 75% during the rainy season. Soil types varied from sandy (goz) in north to heavy clays (vertisoil) and the lighter clay (gardoud) in the south (S.K.D.P, 2000).

2.1. Experimental animals

Sixty two (62) new born kids were used in this experiment. Kids were classified according to sex and number of kids born per doe (Litter size). All kids were ear tagged and treated with the necessary medication against endo- and ecto-parasites (AGVET, USA 1.0 ml/50 kg body weight subcutaneously Ivomec super drench). All kids were kept in separate enclosures constructed from iron bars and wire, and equipped with feeders and water troughs. Inside each enclosure the animals were individually tethered at sufficient distance away from each other. All kids were daily allowed to suckle their mothers, then turned and maintained to grazing on pasture from 8.00 am to 6.00 pm. All kids were weighted at weekly interval from birth up to weaning. The kids were fasted overnight before being weighed. Male kids followed up to weaning time at three months, Female kids were been followed up age at 1st kidding.

2.2. Statistical analysis

The data were statistically analyzed according to complete randomizes design using SPSS v.14.0 software package. Duncan’s Multiple Range Tests (DMRT) was also used to test means significance differences, analysis of covariance was carried out.

3. Results:

3.1. Kid birth weight:

Litter size exerted a significant ($p < 0.05$) effect on kids birth weight. Kids born as single were heavier ($p < 0.05$) than twins and triplets and twins were heavier ($p < 0.05$) than triplets. Twinning rate was found to be 38.1% whereas triplet rate was 9.5%. The single rate was highest (52.4%) (Fig 1). Also sex of kid had highly significant ($p < 0.01$) effect on birth weight. Male kids were heavier than female kids.

Table 1
Effect of litter size and sex of kid on birth weight.

Variables	N	Birth weight(kg)
Litter size		
Single	32	2.10±0.06 ab
Twin	24	2.02±0.05 a
Triplet	6	1.79±0.16 ac
Sex of kid		
Male	32	2.21±0.06 a
Female	30	1.92±0.05 b

Values in the same column followed with different letters are significant at $P < 0.05$ and/or $P < 0.01$.

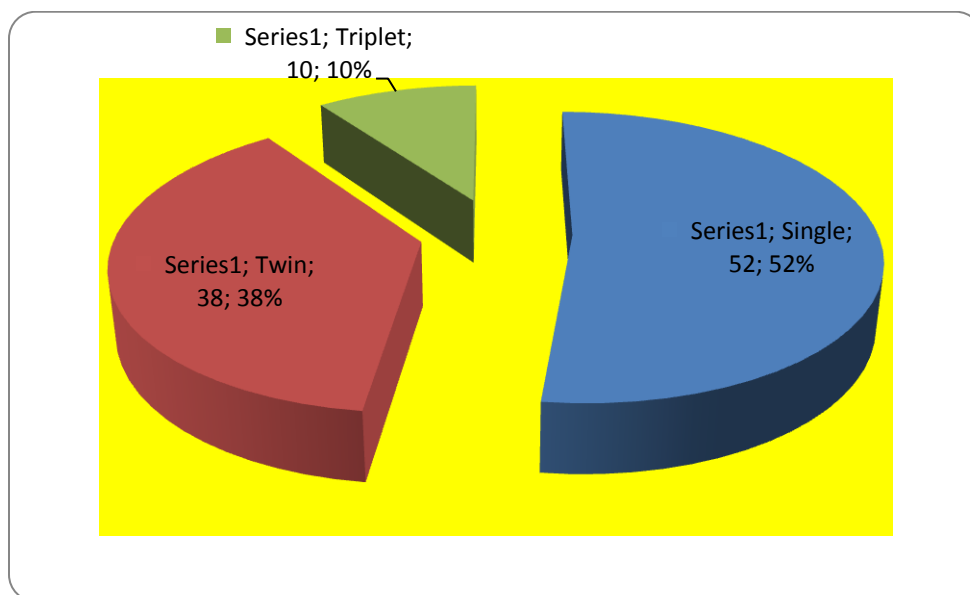


Fig. 1. Litter size in experiment animals.

3.2. Kids weaning weight and body weight gain up to weaning

Weaning weight was significant ($p < 0.01$) affected by litter size were highest ($p < 0.01$) weight was found in single born kids 8.63 ± 0.24 kg and twin 8.11 ± 0.26 kg. The lowest ($p < 0.01$) weight was measured in triplet kids 7.41 ± 0.51 kg Table (2). The pre-weaning weight gain exerted a significant ($p < 0.05$) effect on litter size. Single born kids recorded higher body weight gain compared to twins. Twin recorded highest body gain than triplets. Table (3). The daily weight gain of the weaning weight was non-significantly ($p < 0.05$) affected by litter size Table (3). The sex of the kids had statistical significant ($p < 0.05$) effect on weaning weight. Male had heavier weight of compared to female kids Table (2). Also sex of kid significantly ($p < 0.01$) effect on the total gain up to weaning age, where males gains more than female kids. Male kids had ($p < 0.05$) the heaviest daily gain 68.56 ± 2.97 g/day compared with female kid 57.78 ± 2.73 g/day Table (3).

3.3. Effect of litter size on body weight at puberty and at first kidding

The results indicated that litter size had significantly ($p < 0.01$) affected the weight at puberty, female kids born as single had heavier weight at puberty than twin and triplets. Weight at 1st kidding was not statistically affected; however, single born kids secured heavier body weight compared to the both twin and triplet, at weight of 1st kidding Table (4).

Table 2

Effect of litter size and sex of kid on body weight at weaning (kg).

Variables	N	Weaning weight(kg)
Litter size		
Single	27	8.63 ± 0.24 ^{ab}
Twin	22	8.11 ± 0.26 ^a
Triplet	5	7.41 ± 0.51 ^{ac}
Sex of kid		
Male	30	8.38 ± 0.28 ^a
Female	24	7.12 ± 0.26 ^b

Values in the same column with different letters are significantly different at $P < 0.05$ and/or $P < 0.01$.

Table 3

Effect of litter size and sex of kid on body weight gain of kids from birth to weaning.

Variables	N	body weight gain/kg	Daily body weight gain/g
Litter size			
Single	27	6.53 ± 0.22 ^{ab}	72.55 ± 2.49
Twin	22	6.09 ± 0.25 ^a	67.67 ± 2.77
Triplet	5	5.62 ± 0.48 ^{ac}	62.44 ± 5.39
Sex of kid			
Male	30	6.17 ± 0.27 ^a	68.56 ± 2.97 ^a
Female	24	5.20 ± 0.25 ^b	57.78 ± 2.73 ^b

Values in the same column followed with different letters are significant at $P < 0.05$ and/or $P < 0.01$.

Table 4

Effect litter size on body weight changes

Litter size	N	Body wt at puberty	Body wt at 1 st kidding
Single	10	14.16 ± 0.34 ^{ac}	20.03 ± 0.41
Twin	8	13.55 ± 0.29 ^a	19.68 ± 0.35
Triplet	3	11.62 ± 0.43 ^{bd}	19.02 ± 0.52

Values in the same column followed with different letters are significant at $P < 0.05$ and/or $P < 0.01$

3.4. Effect of litter size on age at puberty and at first kidding

The litter size exerted non significant effect on age at puberty and at 1st kidding. It is worth mentioning, however, that single born kids were relatively younger than both twins and triplets kidders in the studied traits Table (5).

Table 5
Effect of litter size on productive age of experiment animals.

Litter size	N	Age at puberty	Age at 1 st kidding
Single	10	175.68±12.86	358.10±15.01
Twin	8	195.31±9.94	384.86±9.56
Triplet	3	206.61±8.19	387.81±11.60

Values in the same column followed with different letters are significant at P<0.05 and/or P<0.01

3.5 Mortality rate in kids:

Sex of kid has exerted a significant ($p<0.05$) effect on mortality rate. The data indicated that female kids recorded higher mortality rate than male kid. The respective rates were 30% and 9.4 % for two sex kid Table (6). The main reason for death is the low birth weight, respiratory disease and lost in rangeland. The overall mortality rate in this study was 19.0%.

Table 6
Effect of sex of kid on mortality rate.

Sex of kid	No. of kids	No. kid died	%Mortality rate
Male	33	3	9.4
Female	30	9	30

4. Discussion

The effect of type of birth on kids birth weight clearly demonstrated that in this study single kids were heavier than twin kids, and twins were heavier than triplets, those results were consistent with Song et al (2000), Madibela et al (2002) and Zeleke (2007). The differences in birth weight in different litter size may be due to the small size and weight of the twin and triplets in the uterus. Das et al (1996) confirms this results that birth weight decreased with increase in litter size, that lambs in utero, as the number of foetuses increase, the number of caruncles attached to each foetus decreases, thus reducing the feed supply to the foetus and hence reduction in the birth weight of the lambs. This study showed that males were generally heavier than females at birth. Similar results were found by Gubartalla et al (2002), Madibela et al (2002), Abu Nikhaila and EL Hag (2003) and ELimam et al (2007) for Taggar goats, the heaviest of male kids to female attributed to the anabolic effect of male sex hormones during pre-natal growth and to uterine environmental, these result comply by Nieto et al (2006).

The growth rate during the pre-weaning period was significantly affected by type of birth, and which was slightly higher in single born kids compared with twins and triplets. The twin born kids were heavier at birth and maintained a higher growth rate up to weaning compared to triplet kids, Gubartalla et al (2002) reported similar findings. The pre-weaning daily gain was higher for single kids compared with multiple births (twin and triplets kids), these results consistent with Besicher et al (1992), Madibela et al (2002), and Zeleke (2007). Lyatuu et al (1994) also reported that after birth, single kids had an advantage over twins as twins had to compete for milk from their dam's, single kids had sufficient milk for growth to weaning. Moreover Zeleke (2007) and Dadi et al (2008) confirmed that the type of birth exert a significant influence on weaning weight.

During the pre-weaning period the sex of the kid showed a highly significant effect on birth weight and in subsequent growth rate. Male kids were heavier at birth than female kids and tended to have a higher average daily gain. In this study the results showed that male kids gained more than females, and were heavier than female in subsequent growth rate and grew faster than female kids. These results were consistent with that observed by Abu Nikhaila and EL Hag (2003), Zeleke (2007) and Dadi et al (2008) who reported that the male kids exhibited higher live weights than female kids. The high weight gain for the male kids may be due to the effect of male sex

hormones and the aggressive nature of male during suckling and feeding. Those variations in weaning weight may be due to different breeds and differences in management particularly in the time or (age) at weaning.

The type of birth significantly affected the body weight at puberty, single born kids exhibited high body weight 14.16 ± 0.34 kg compared with twin kids 13.55 ± 0.29 kg. The lowest body weight was recorded in triplet's (11.62 ± 0.43 kg); this variation in body weight may be due to that single born kids grow faster than both twin and triplets. Single born had access to their dam's milk with no competition as in the case of twin and triplets.

The single born kid's exhibit puberty at earlier ages of compared with twin and triplets born kids. However, twin born kid had shorter days to puberty than triplets, similar results obtained by Zeshmarani et al (2007) for Assam goats (259 ± 2.5 , 265 ± 2.4 and 269 ± 3.66) for single, twin and triplets kids, and this may be due the slow growth of twin and triplets kids and to the competition between kids for mother milks. The differences in age at puberty may be due to availability and quality of feed, the rainy season which promotes growth rate and hence an early age of sexual maturity.

The single born female kid exhibited higher body weight at kidding compared to triplet born female kids. The insignificant superiority of single born female in this study may be related to the lack of competition between single and multiple births for the mother's milk and or other available nutritional resources whereby single born are always at an advantage compared to multiple births.

The litter sizes also lend itself as potential effectors on age at first kidding. Single born females kidders for the first time at a younger age (10.9 months) when compared with twin and triplet born mates (11.9 and 11.5 months) respectively. The differences between these ages however did not secured a statistical significant ($P < 0.05$). This result is comparable with the findings cited by Marai et al (2000) and Zeshmarani et al (2007) who documented the effect of litter size on age at first kidding in Assam goat as they postulated that single born females gave their first kid at a younger age in comparison with twin and triplet born mates. The longer ages reported by the authors reflected breed as well as other environmental factors involved between the two studies.

General the effects of litter size on birth weight, weaning weight, and hence age at sexual maturity and age at 1st kidding seem to exert their role indirectly through nutrition. Likewise single born kids had the advantage of non competition situation for the already meager quotation of the mother's milk. A litter size with more than one kid will widen the gap between kid's needs and the actual milk produced by the mothers thus leading to a superior performance of singles compared to twins and triplets.

The overall of abortion rate obtained in present study was 13.04%. Different abortion rates were reported in the literature, the difference between the studies can be attributed to several comply factors including breed, season of birth nutrition, health care, environmental factors and level of management. Marai et al (2000) reported a lower abortion rate (1.4%) in their study. One or more of the prementioned factors could contribute to the difference between the two studies.

The overall mortality rate in this study was 19% from which 14.7 occurred during the pre-weaning period and 4.3% during the post-weaning, the major causes of mortality among the born kids were caused by respiratory infections and low birth weights, Ikwuegbu et al (1996) reported in their study a mortality rate of 14.5%, while other authors postulated higher values in the same breed of goats (Taggar) as 26.45% (Elimam et al, 2007). Mtenga et al (1994) on other hand found that preweaning mortality accounted for 40.6 while postulated mortality rates were 25.7%. It was noticed that most of mortalities in kids occurred among the females (30%) compared with males (9.3%). This result confirms that sex significantly affect kids mortality. The higher mortality rate among female may be attributed to the low birth weight of female kids.

5. Conclusion

The results showed that concentrate supplementation improved reproductive and productive traits of Taggar goats under grazing condition. However, animals lost live weight without supplementation under the same feeding regime. Therefore, supplemented of grazing goats with concentrate ration may be suggested to optimize growth performance. Further studies with different levels of concentrate supplementation may be conducted using large number of animals for a longer period to get more detailed information related to reproductive performance.

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