

Effect of sex of kids and Litter size on Taggar goat Kids performance[†]

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SUMMARY

The experiment was conducted to evaluate the effect of litter size on Taggar goat Kids performance. Sixty two (62) kids of Taggar goats which were divided into 3 groups according to sex and the number of kids born per doe (Litter size): Single Kids group (32), twin kids group (24) and triplet kids' groups (6). The results indicated that the birth weight on single kids' groups was 2.10±0.06 kg, the twin group was 2.05±0.05 kg and the triplet group 1.7±0.16 kg and there were no significant ($p \geq 0.05$). The effects of litter size on weaning body weight at were 8.63±0.24 kg, 8.11±0.26 kg and 7.41±0.51 kg. The effects of litter size on body weight gain of kids from birth to weaning were 6.53±0.22 BW/kg, 6.09±0.25 BW/kg and 5.62±0.48 BW/kg. The effect of little size on Body weight at puberty age was 14.16±0.34 kg, 13.55±0.29 kg and 11.66±0.43 kg. The effect of litter size on puberty age were 175.63±12.86 days, 195.31±9.94 days and 206.61±8.19 days and also at first kidding age was 358.10±15.01 days , 384.86±9.56 days and 387.81±11.60 days and there was no significant ($p \geq 0.05$) among the groups. From the study conclude that litter size has a positive effect single kids' group and has a negative effect on the triplet kids' group.

Keywords: Taggar, goat, production, reproduction, concentrate ration, dry land, Sudan

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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 does 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 affect 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 the 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.

MATERIAL AND METHODS

This study was implemented in the Dalanj area (longitudes 12.02° N, Latitudes 29.39°E) Southern Kordofan state in Dalanj University Sudan. 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).

Experimental animals

Sixty two (62) new born kids were used in this experiment. Kids were divided into 3 groups according to sex and the number of kids born per doe (Litter size): Single Kids group (32), twin kids group (24) and triplet kids' group (6). All kids were 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 being followed up age at 1st kidding.

Statistical analysis

The data were statistically analysed 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 (1999).

RESULTS

Kid birth weight

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

Table 1: The 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 by different letters are significant at $P \leq 0.05$ and/or $P \leq 0.01$

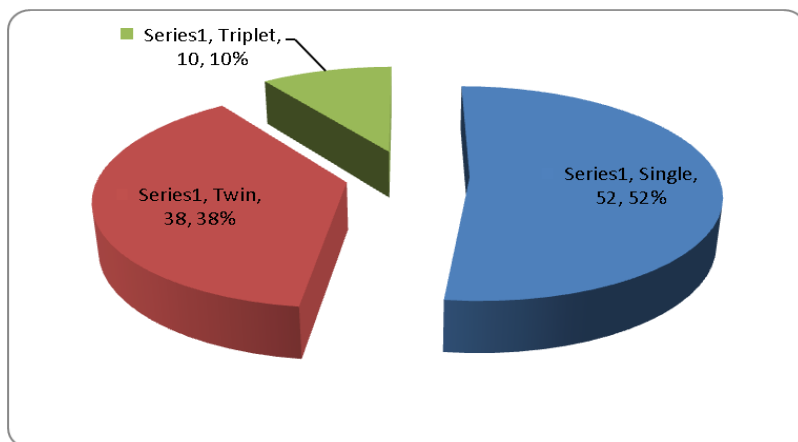


Fig 1. Litter size in experimental animals

Kids weaning weight and body weight gain up to weaning

Weaning weight was significant ($p < 0.01$) affected by litter size where the 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).

Table 2: The 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 ($P \leq 0.05$) and/or ($P \leq 0.01$)

The pre-weaning weight gain exerted a significant ($p \leq 0.05$) effect on litter size. Single born kids recorded a higher body weight gain compared to the twins. Twin recorded highest body gains 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 statistically significant ($p < 0.05$) effect on weaning weight. Male had a heavier weight of comparable to female kids (Table 2). Also sex of kid significantly ($p \leq 0.01$) effect on the total gain up to weaning age, where males gain more than female kids. Male kids had ($p \leq 0.05$) the heaviest daily gain 68.56 ± 2.97 g/day compared with female kid 57.78 ± 2.73 g/day (Table 3).

Table 3: The 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 by different letters are significant at $P \leq 0.05$ and/or $P \leq 0.01$

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

The results indicated that litter size had signed ($p \leq 0.01$) affected the weight at puberty, female kids born as the single had a 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 a weight of 1st kidding (Table 4).

Table 4: The effect litter size on body weight changes

Litter size	N	Body weight at puberty (kg)	Body weight at 1 st kidding (kg)
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 by different letters are significant at $P < 0.05$ and/or $P < 0.01$

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

The litter size exerted a 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: The effect of litter size on productive age of experimental animals

Litter size	N	Age at puberty (days)	Age at 1st kidding (days)
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 by different letters are significant at $P < 0.05$ and/or $P < 0.01$

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. The 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

DISCUSSION

The effect of the type of birth on kids' birth weight clearly demonstrated that in this study single kids were heavier than twin kids, and the twins were heavier than triplets, these 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 these results that birth weight decreased with increase in litter size, that lambs in utero, as the amount of foetuses increase, the number of councils attached to each foetus decreases, thus reducing the feed supply to the foetus and hence a 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 (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 triplet 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 the 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 exerts 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 (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 the 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 low 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 grew 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 kids exhibit puberty at earlier ages of comparing with twin and triplets born kids. However, the twin born kid had shorter days of 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 triplet kids, and this may be due to the slow growth of twin and triplet kids and to the competition between the 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 effects on age at first kidding. Single born female's 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 secure a statistical significant ($P \leq 0.05$). 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.

Generally 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 the

non-competitive situation for the already meagre quotation of the mother's milk. A litter size with more than one kid will widen the gap between kids' 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 the 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% of 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 the 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 affects kids' mortality. The higher mortality rate among female may be attributed to lower birth weight of female kids.

CONCLUSIONS

The results obtained in the present study indicate that litter size has a positive effect of birth weight body weight gain and weaning weight also the age at puberty (days) was decreased in the single tagger kids' group, but the litter size has a negative effect on growth and reproductive performance of the triplet tagger kids group and there no significant difference among the groups. Just there was a significant difference ($P \leq 0.05$) between male and female.

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