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Comparative Study on Productive and Reproductive Traits of Desert and Taggar Goats under Natural Grazing during Rainy Season

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ABSTRACT

The experiment was conducted on South Kordofan state at Al Debabat locality to investigate and compare some productive and reproductive performances of Sudanese Desert and Taggari goats under traditional management system depended on natural grazing. Thirty five male and female Sudan Desert and Taggar goat kids were used in this experiment. The kids were born during the rainy season, to parent stock raised on traditional on natural grazing. The result revealed that birth weight, growth rate at different ages, pre-weaning average daily weight gain of kids , weaning weight, body weight and age at puberty and body weight at first kidding was significantly ($p<0.01$) affected by genotype of the breed. Desert kids showed better birth weight and weaning weight than Taggar kids. The result revealed that Desert kids have larger ($p<0.01$) body weight at puberty but exhibit longer time to show first estrous compared with Taggar kids. Body weight at first kidding was significantly ($p<0.05$) larger for Desert kids than Taggar kids, but age at first kidding wan not affected by genotype.

Keywords: *Desert, Taggar kids, breed, genotype, Sudan, performance*

INTRODUCTION

Goats are widely distributed around the world with high demand for their meat in many developing and subtropical countries and arid regions (Casey et al., 2003). In most of these countries, the productivity of goats is below their potential with inefficiency at primary production and post production system (Matossian de Pardos, 2000). Goats are a neglected animal in the Sudan despite the fact that they play a very important role in the rural economy. They live mostly on grazing poor natural pastures in arid and semi arid areas with no supplementary feeding. They live as scavengers in the streets of towns and cities requiring minimum care and attention despite the fact that they provide many poor urban and rural families with milk and meat (Khadiga et al., 2008 and Ismail et al., 2011). Sudan have two breed for meat goat, they were the Sudanese desert and Taggari goats. In Sudan and other arid regions, desert goats are mainly raised for meat production especially in rural areas and also provide milk for family needs and variety of fiber (El-Fadil 2001, Galal 2005). In some countries goats also provide a major source of animal protein and household cash income for smallholder farmers (Toplu & Altinel 2008). The Sudanese mountain goats (Taggar) are classified also as meat type, and are widely distributed in many parts of Sudan and they are concentrated in Nuba mountain of Southern Kordofan (Bushara et al., 2010).

Those breeds received very little concern in research investigating their productive and reproductive traits as meat breed, despite their large distribution in the Sudanese rural community where they play important economic roles. Indigenous goat breeds are well adapted to semi arid tropical conditions, with a high degree of heat tolerance and are partly resistant to many of the disease prevailing in the semi arid areas. Not to mention their ability to survive long periods of feed and water shortage (Bushara et al., 2010).

Meat goat production and industry in the Sudan has increased steadily over the last decades. It is important for managers in this emerging industry to understand how breeds and breed

combinations compare for economically important kid traits from birth to weaning. This awareness allows for diversity among breeds to be exploited through proper breed selection to match production or market environments and to gain crossbreeding advantages. Meat goat producers in the Sudan do not have abundant breed resources to consider as found in other ruminant livestock industries. Furthermore, comparative evaluations of meat goat breeds for preweaning kid performance have received inadequate research attention in the Sudan.

Reproductive efficiency in does is characterized by the individual and compound parameters. A high rate of reproductive efficiency is generally thought to be the most important prerequisite for the production of meat, milk, skins, and breeding stock (Herold et al., 2007), therefore an assessment of the general reproductive characteristics of native breeds is necessary prior to developing strategies aimed at improving meat supplies (Alexandre et al., 2000 ., Berhane and Eik, 2006). Birth weight and the growth of kids until weaning, together with reproduction birth characteristics, dressing percentage, meat quality, certain tissue share and others, are reliable indicators of the breed efficiency in the production of meat (MIOČ et al, 2011, Sundaram et al ., 2012). High pre-weaning daily body gain not only reflects the genetic potential of growing animal but also the mothering ability of its dam, whereas, during the post–weaning period, nutritional status of the animal is an important factor to be considered (Lawrence and Fowler, 1997). Studies conducted by various authors reflected the facts that grazing alone may not be sufficient for optimum live weight gain and reproductive performance of goats. Keeping this view in mind, the present study was therefore undertaken to investigate and compare some productive and reproductive performances of Sudanese Desert and Taggari goats under traditional management system depended on natural grazing to exploit the potentialities of goats for the welfare of the rural poor and village community.

MATERIALS AND METHODS

The present study was conducted in South Kordofan state at Al Debabat locality (100 km south of ELObeid) which lies within the medium rain (500mm) woodland savannah (longitudes 12.39˚ N, Latitudes 29.48˚E). The soil types varied from sandy (goz) in north to heavy clays (vertisoil) in the south. The mean monthly temperature ranged from 31.3 C° in April to 25.8 C° in July, annual rainfall ranging between 500-800 mm, with peak rain in August (S.K.D.P, 2000)

Experimental Animal's Management and Diets

Thirty five male and female Sudanese goat kids (18 Sudanese Desert kids and 17 Taggari kids) were used in this experiment. The kids were born during the period rainy season of year 2012, to parent stock were advanced pregnant does (12 Desert goats and 12 Taggar goats) raised on traditional management. All animals were treated with the necessary medication against endo-and ecto-parasites (AGVET, USA 1.0 ml/50 kg body weight subcutaneously Ivomec super drench) and vaccinated against Anthrax and Hemorrhagic Septicemia. The animals were ear tagged, weighted and divided into two groups as group A is Taggar goats (does and kids) group B is Desert goats (Does and kids). The grazing zone of these animals was in the around the study area, The parent stock was prepared to be kidding during the beginning of the rainy season. The two breed were divided into two groups. All goats and their kids were allowed day grazing from 8.00 am to 6.00 pm and in the evening they were kept indoors in enclosures. Watering was once a day from running surface water (Khors) during the early wet season and from excavated ponds at the end of the season. Kids born to these goats were allowed to freely suckle colostrum for the first three days after parturition, thereafter they were separated from their dams during the day. In the evening half of their dam milk was milked before kids were released to spend the night with their dams. Kids were weaned at three month of age. The birth weight was taken immediately after birth and when kids were dry. All kids were then weighed at weekly intervals up to age at first kidding; the animals were weighed in the morning.

Statistical Analysis

All the data obtained from the experiment were analyzed with; means and standard errors of the different traits were computed. Analysis of variance was performed in accordance to general linear method. Duncan`s multiple range test was used with factors that had significant effect on the traits studied. All techniques of the statistical analysis were conducted using

Statistical Package for the Social Sciences, software package (SPSS, 1999).

RESULTS

Effect of Breed on Birth Weight and Litter Size

The results show that the live body weight at birth of breed were significantly (P<0.05) affected by genetic type (Table 1). Desert goat showed higher live weight at birth and higher litter size than Taggari goats.

Table1. *Effect of breed on birth weight and litter size of Sudanese goats (means ± SE)*

Goat types	No	Birth wt (kg)	Litter size
Taggar	17	1.95±0.04[b]	1.42±0.15[b]
Desert	18	2.15±0.07[a]	1.50±0.19[a]
[ab] Values in the same column followed with different letters are significant at P<0.05			

Effect of Breed on Growth Performance of Sudanese Goats

The two breeds exert and significant (P<0.05) effect on growth in different age until weaning with higher (P<0.05) daily body weight gain for Desert goats compared to Taggar goats as shown in Table 2.

Table2. *Effect of breed type on growth rate of Sudanese goats (means ± SE)*

Variable	N	30 days	60 days	90 days	Gain /day/ g
Taggar goats	16	3.33±0.19[b]	5.33±0.19[b]	8.44±0.19[b]	72.14±1.65[b]
Desert goats	15	4.32±0.14[a]	6.97±0.22[a]	10.83±0.34[a]	95.91±3.64[a]
[ab] Values in the same rows followed with different letters are significant at P<0.001					

Effect of Breed on Weaning and Puberty Weight of Sudanese Goats

The Desert goats showed significant higher (P<0.05) body weight at weaning time and at puberty time as 10.835±0.34 and 10.835±0.34 respectively compared with taggar goats (Table 3), but Taggar goats had significant (P<0.05) advance to desert goats on time of puberty.

Table3. *Effect of breed on weaning and puberty weight and age of puberty of Sudanese goats (means ± SE)*

Goat types	No	weaning weight (kg)	No	Puberty weight (kg)	Time of puberty(days)
Taggar	16	8.41±0.19[b]	**8**	18.59±0.34[b]	211.33±5.48 [b]
Desert	15	10.84±0.34[a]	**7**	23.09±0.44[a]	242.57±4.97 [a]
[ab] Values in the same column followed with different letters are significant at P<0.001					

Effect of Breed on Body Weight and Age at First Kidding of Sudanese Goats

The genotype of the breed significantly (P<0.05) affected body weight at first kidding where Desert goats showed higher weight compared with Taggar goats (Table 4). The genotype of the breed on the other hand seemed to exert a non significant effect on age at first kidding of the two breeds (Table 4).

Table4. *Effect of breed on body weight and age at 1st kidding of Sudanese goats (means ± SE)*

Goat types	No	body weight at 1st kidding (kg)	age at 1st kidding(days)
Taggar	8	22.84±0.29[b]	384.33±6.51
Desert	7	25. 91±0.24[a]	397.70±12.12
[ab] Values in the same column followed with different letters are significant at P<0.001			

DISCUSSION

Birth Weight

In this experiment, Desert goats tended to have a better reproductive performance compared to the other genotype of Taggar goats as shown by an excellent fertility, heavier birth weight of kids, fastest growth rate and heaviest litter at weaning. The importance of information on birth weight and body growth rate stems from the fact that future of any goat production investment depends upon successful program for raising kids for replacement of parent stock (Berhane and Eik, 2006). The birth weight of the type of breed significantly affected the birth weight where Desert goats showed higher body weight at birth compared with Taggar goats, this result with same of Bushara and Abu Nikhaila (2011) , ELBuckhary (1998), ELimam et al. (2007) for the Taggar kids, Zeleke (2007) and

Ng'ambi et al. (2008) and lowered than the results of Zeinelabdeen et al (2011) for Nilotic kids .Birth weight of Desert it seemed very high same results were obtained by Mohammed and El-imam, (2007), Bushara et al (2017) for Peri-urban Desert goats and higher than the results of Ali (2010) 1.84 ±0.04 for same breed, and lowered than the results of Ismail et al. (2011) for desert goat (2.4±0.02 kg) and El-Abid, (2008) for Sudanese Nubian kids (2.3 ± 0.5 kg). The different birth weight of the two breed in study agree with Banerjee and Jana, (2010) whom reported that the differences in birth weight in livestock may be attributed to the effect of breed besides of the non genetic factors. Also agree with results of Abdel-Azeem, (2006) who reported that the genotype of both the mother and the foetus play a vital role in determining the birth weight, while the consequent litter weights basically depend, beside the foetuses genotype, on the suckled milk from the dam. Generally the significant difference in birth weight of kids resulting from the random effects of the dams can be attributed to the natural variation occurring in the prenatal and post birth nutrient supplied by mothers. Which agree with Madibela et al. (2002) who attributed the low birth weight of kids to the dams nutrition during gestation. The litter size increases the pool of offspring for further reproduction or sale for individual farmers. Goat is the most prolific ruminant of all domesticated ruminants in tropical and sub-tropical regions. Litter size (LS) for Desert in 1.5±0.19 is significantly higher compared to Taggar 1.42±0.15. Same results of Desert goats litter size is obtained by Guney et al (2006) for Damascus goat (1.56), and lowered than reported by Webb and Mamabolo (2004) of South African indigenous goats (1.7 kids per doe), Hossain (2004) on Black Bengal goats (1.6 kid), Browning et al (2004) for Boer (1.92 kid), Kiko (1.82 kid) goats of South Africa. The litter size of Taggar goats is similar to the finding of Bushara et al (2010) for same breed and higher than that obtained by Hajer (2003) for South Darfur indigenous goats (1.1), EL Hag (1990) in Sudanese Nubian goats (1.0 kid), Rojero et al (2005) for Celtibernan (1.1), Creole (1.4) and Nubian (1.1) goats in Mexico, and lowered that reported of Shalaby et al (2000) litter size at birth was 1.74. The results of previous studies generally show that litter size are the most variable traits reported for indigenous goats in Sudan. This shows the presence of huge opportunity to improve these traits through selection and improved management focussing on breeds having better potential for the traits. Production system also affects litter size significantly. Faruque et al. (2010) has shown that litter size is higher in intensive systems compared with semi-intensive systems.

Growth Rate and Pre Weaning Gain and Weaning Weight

The growth rate and pre weaning gain of kids of the two breed showed significant affect. Growth rate was significantly (P <0.01) higher in the Desert goats than in Taggar goats. The daily body weight gain in Desert goat from birth to three months was 95.91g higher than that for Taggar goat 72.14 g. Dereje et al., (2015) found average weaning weights of Abergelle and Begait goats in Ethiopia at the age of three months are found to be in the range of 9 and 10 kg. This results were higher than that reported by El-Abid et al (2008) who found average pre-weaning daily weight gain for the Nubian kids was 63.3 ± 3.9 g and Berhane and Eik (2006) for Ethiopian Abergelle goat`s kids, (Muluken 2006) for Abergelle goat 62.6 g/day and Guney et al. (2006) for Sudanese desert and Damascus goat`s kids respectively. The difference in growth rate between two breed may be due to management system that practice, and this is agree with Dereje et al (2015) who stated that the system of production had significant effect on preweaning growth rate. The results are generally attributed to fact that these kids were more mature at birth and their physiological systems were more developed to respond better to good nutrition, also could be accounted for in terms of milk yield and composition. Nieto et al (2006) reported that, in early life of the kid, weight gain depends on milk consumed as the only source of feed, so the dam's producing capacity will influence the growth rate of kids. Generally the growth rate of the ruminant grazing tropical pastures or consuming crop residues alone are generally low and represent only about 10% of the animals genetic potential (Tedonkeng Pamo et al,2002).The variation in gaily body weight gain may be due the variation in time of measurement of body weight and different breeds size.

The Weaning Weight

The weaning weight of two breed showed significantly affect of genotype where Desert goat (10.84±0.34 kg) recorded higher body

weight at weaning time compared with Taggar goat (8.41± 019 kg). Different weight and weaning were reported by Gubartalla et al (2002) 7.35±1.10 kg, Muluken (2006) 7.9 kg for Abergelle, Acero-Camelo et al (2008) 8.17 and 7.78 kg. Same results for Desert goats obtained by Karua and Banda (1994) 10.7, and higher results were reported by Karua and Banda (1994) 11.4 kg, Lyatuu et al (1994) 12.5±0.12 and 11.6±0.34 kg. Those results showed that the body weight at weaning in affected by breed which agreed with Dereje et al (2015) who stated that weaning weight of kids is influenced by breed, birth weight and lactation performances of dam, weaning age, pre-weaning nutrition and litter size. The discrepancies may be due to breed variation and differences in management particularly the age of weaning in which highly gain are calculated when weaning is conducted in early age and that due to the weight gains during the early-pre-weaning growth stages. Also the differences in the pre-weaning weight gains are closely associated with the differences in level of milk intake during milk feeding period and the nutritional status of the doe which agree with Debele et al (2015). In this study all kids were born the same season which is during rainy season. The effect of season on growth rate of kids is negligible and reported in the literature (Zeleke, 2007; Ahuya et al., 2009; and Belay and Mengistie, 2013).

Body Weight and Age at Puberty

The body weight and age at weaning time in both groups of breed (Desert & Taggar goats) was significantly ($p < 0.05$) effected by gene type and found to be heavier for Desert goats compared Taggar ones, but on other hands Taggar goats showed significant decrease on age at puberty compared with Desert goat which exhibits longer time from birth to puberty time. The large body weight of Desert goats showed its gene make up which tended to increase this result is in line with Chowdhury et al., (2002) and Malau-Aduli et al., (2005) and lowered than that reported by by Gubartalla (2002) for Nubian goats (16.26 kg) and Zeinelabdeen et al.,(2011) Nilotic goat (13.2 kg). Taggar goats showed lowered body weight at first estrous may be due to some environmental factors, the result here is higher than that obtained by Faruque et al. (2010), Bushara et al., (2011) and Zeinelabdeen et al.,(2011) for Nilotic goat (271.3 days). Many authors showed that some breed exhibit earlier estrous and reached puberty at an earlier age compared as in this study. These results were consistent with Malau-Aduli et al. (2005), ELimam et al. (2007), Hassan et al. (2007) and Zeshmarani et al. (2007). Or longer time to showed first estrous as reported by Thiruvenkadan et al (2000) for Kanni Adu goats (9.38±0.11 month), Mohamed and ELimam (2007) for desert goats (15.95±0.20 months), Tolera and Abebe (2007) 14.6±6.6 months. In this study the genotype had reduced the age at first oestrus. Generally Gordon (1997) stated that sexual maturity is mostly dependent on weight rather than age. So good management and care of female kids allow them early attainment of puberty (Alexandra et al., 2001), so it was also noted that faster growth rate resulting from higher plane of nutrition enable kids to attain puberty at younger age than kids reared on low plane of nutrition.

Body Weight and Age at First Kidding

It was also noted that faster growth rate resulting from higher plane of nutrition enable kids to attain puberty at younger age than kids reared on low plane of nutrition. The Desert goats kids showed significantly higher body weight at first kidding compared with Taggar goat kids here the phenomenon of genetic is clearly appearance and this results agree with (Banerjee and Jana, 2010 and Assan, 2013). Higher body weight at kidding was reported by Gubartalla (2002) for Nubian goat (24.2 kg), Silva et al (1998) for Alpine and Mexican goats (25-30kg) and Zeshmarani et al (2007) for Black Bengal. All those results reflect the affect of genotype among breeds. The present review shows that the indigenous goat breeds of Sudan tend to have their first kids before they are two years old even that the results of this study were not significant. The earliest age at first kidding was recorded in some traditional production systems of the tropics (Dereje et al., 2015). Hence, the average age at first kidding (AFK) for tropical goats is longer and ranges between 12 and 24 months (Devendra and Burns 1983).

Age at first kidding varies considerably in the literature from lowest age at first kidding noticed by Ince (2010) 387 days, Faruque et al. (2010) Black Bengal goats 370.0±25.5 days in semi-intensive system, ELimam et al (2007) Taggar goat (13.1 months) to highest age at first kidding reported by Ahuya et al. (2009) 759.4 days, Dereje et al., (2015) 516.9 days or 17 months, Rout et al (2000) for Jamunapari goats 700±9.1 day, Thiruvenkadan et al (2000)

for Kanni Adu goats (14.63±0.11 month) Hassan et al (2007) 360.5±10 days for Black Bengal goats, Hossain et al (2004) 401.53±2.08 days for Black Bengal, Dey et al (2007) 422 day for Indian goats, Riberio et al (2000) 402.3±19.1 for Saanen, Song et al (2006) 412.1±32.7 day for Korean native goats in range. The variation of age at first kidding is often due to the environmental factors such as nutrition, temperature and health. Does living in harsh environments (related to environmental factors) are expected to have a higher AFK than does living in optimal environments (Dereje et al., 2015). The smaller sample size was responsible for non-significant for the effect of breed on age at first kidding. Generally the results of this study it seemed very good that there is a hope for future ability for improvement of the goats flock in Sudan, since those goats managed under natural grazing where quality and quantity of pasture available to the weaned kids which promote the good growth rate.

CONCLUSIONS

It could be recommended from the trial that Desert kids have better growth performances than Taggar goat. The significant effect of breed at different ages indicates the potential of the breed for better productivity under improved management system. Therefore, the significant effect of fixed effects needs to be considered in developing breeding strategy for the breed. Moreover, integrated efforts combining the feed, breeding and nutritional aspects of production are very important to make use of the breed.

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