

Pre and post-weaning performance of Crossed kids F1 (Desert and Damascus) under the traditional management system, North Kordofan- Sudan

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ABSTRACT

This study was conducted in North Kordofan state- Sudan, during Feb 2018- March 2020 to evaluate pre and post-weaning performance of F₁ kids under the traditional management system. Forty three kids (25 males and 18 females) were used in this study. Sex, litter size and birth weights of kids were recorded immediately after birth. Following that, weights of kids were taken periodically every week up to weaning time (4th months). The pre-weaning total gains and daily gains were calculated. Post-weaning parameters of kids (phenotypic characters and performance up to maturity) were also recorded. Data were analyzed using SPSS, V23, 2017. The results showed that male kids were significantly (P<0.01) heavier at birth than females and birth weights decreased with increase in litter size (single 2.63±0.36, twins 2.06 and triplets 1.68kg). 27% mortality rate was recorded in kids during the pre-weaning period. The average pre –weaning daily gain was 85 and 72 g for males and females kids, respectively. The average weaning weight was 12.95 and 10.69kg for males and females, respectively. The post-weaning average daily gain was 55.13 and 38.80g for males and females, respectively. The flock of kids had different coat colors (light brown, reddish brown and dark brown) and 71% of them had light blue eye color. The udder was somewhat small and attached to the abdomen with length of the teat was 2.46 ± 23 cm. Single born females reach puberty (278.2±7 days) earlier than twins (291.6±9 days), with body weight of 20.01 and 16.91kg for single and twins, respectively.

Key words: Kids, pre-weaning, performance, mortality

Introduction :

Sudan is mainly an agricultural country with a large livestock population; Nomads own most of this population (FAO, 1992). Goats in Sudan play an important role in the economy of the country and in the life of many Sudanese families as a favorite household dual purpose animal (milk and meat). Their importance is well recognized in rural areas of the country and Kordofan region in particular where under the harsh sem-arid conditions, raising goats proved being the most suitable livestock production pattern by the small subsistent farmers.

The Sudan Desert goats are known as meat producing animals especially in rural areas. They represent about 27.1% of the total goats' population of the country, ranking second to the Nubian goats (Hassan, 1977). Goats in North Kordofan state are estimated at 3591 thousand heads forming about 27.43% of total farm animals in the state (Ministry of Animal Resources and Fisheries, 2009).

Materials and methods

Forty four female Desert goats with average age of 3-4 years and average body weights 33.18±0.84 kg, were purchased from the local markets. Two mature Damascus bucks were

used in the experiment in addition to two castrated local young ones (teasers). All animals were identified using ear tags, tested for brucellosis and treated against external and internal parasites. The flock was set free during the day and kept in closed pen during the night when they are supplemented with concentrates (300g-400g/head/day). The bucks were left free with the females all through the day. After completing mating bucks were then isolated from females and the latter continued depending on natural grazing. During gestation period goats were closely observed up to the time of kidding. Data concerning crossed kids (phenotypic characters and performance up to maturity) were recorded. Forty three F1 kids (25 males 18 females) were used in this study. Sex of kids, litter size and birth weight were recorded immediately after birth. Kids were weighed periodically every week up to weaning time (4th months). The pre-weaning total gains and daily gains were calculated. After weaning kids were weighed twice every two weeks up to maturity (7-8 months). The post-weaning total and daily gains were calculated.

Data Analysis:

Data were analyzed using Statistical Package for the Social Sciences, software package (SPSS, V23, 2017).

Results and Discussion:

Pre-weaning performance:

Birth weight and weight up to weaning age

Molic (1970) reported that birth weight is affected by genetic and environmental factors including breed, sex, type of birth, age and weight of the dam and plane of nutrition. In the current study, average birth weight of males kids (2.74 ± 0.48 kg) was significantly ($P < 0.01$) heavier than that of females (2.04 ± 0.14 Kg). Consistent superiority of male kids has been widely reported by Bushara *et al.*, (2017); Atoui *et al.*, (2015); Hagan *et al.*, (2014); Mahal *et al.*, (2013); Andries, (2013); Otal *et al.*, (2010); Zahraddeen *et al.*, 2008 and ELimam *et al.*, (2007). The heavier weights of males may be attributed to hormonal differences between sexes and their resultant effects on growth (Mahal *et al.*, (2013). Also the results showed that birth weight decreases with increase in litter size with significant difference ($p < 0.05$) between single and twins kids (Table 1). El abid (2002) reported that the average birth weights of Sudanese Nubian kids were 2.489, 1.963 and 1.500 Kg for single, twins and triplets, respectively. Previously, various studies declared that twins-born kids have lower weight than single kids. Keskin *et al.*, (2017), Haldar *et al.*, (2014), Hagan *et al.*, (2014), Andries (2013) and Atoui *et al.*, (2015) stated that the type of birth had significant effect on birth weight. The large body size at birth of single kids may be related to intrauterine environment, which is directly affected by the nutritional status during pregnancy. This result was confirmed by Hagan *et al.*, (2014) who reported that it should be noted that the nutrient intake of the goat gets divided among all gestating fetuses. Therefore, higher number of fetuses results in lower quantity of nutrients allocated to each fetus, and consequently poorer body development, resulting in lighter kids. Also Zhang *et al.*, (2006) mentioned that heavier birth weight for single kids might be attributed to the intrauterine environment where a higher availability of nutrients to the single kid, lack of competition as well as more space may facilitate growth, which the fetus does not have to share with its littermates, thereby attaining higher body weight than the twin or triplet born kids. Similarly, Mahal *et al.*, (2013) stated that the available nutrient shared by more than one kid may be responsible for the reduced birth weight with increasing litter size.

The average birth weights in the current study are in agreement with those reported by Hajer (2003), Mohamed and Elimam (2007) and El.Tahir (2010) for Desert goats. Jing *et al.*, (2010) reported similar results for longling Yellow goats in China. Also birth weights for crossed kids in

the current study were within the range reported by Ismail *et al.*, (2011) for Desert goats in Darfur but higher than that reported by Ageeb (1992) in Baggara goats of South Kordofan and Bushara *et al.*, (2017) for Desert kids reared in Urban management. In Eastern Sudan, the average birth weight of the crossed goats (Desert and Damascus) was higher than that of Desert goats but less than the crossed Nubian and Sannen and less than the birth weight of Nubian kids. The current results are less than the values (3.56 Kg) reported by El Zubeir and Abd El Gadir (2005) for F1 kids of Sannen and Nubian. Sumberg (1985), Mandlate (1984) and Khazaal (2009) stated that the birth weight of Damascus was 4.3kg for male and 4.1kg for female, while sannen birth weight was 4.1 and 3.9 kg for males and females, respectively, under environmental conditions in Lebanon. The average weight at first and second months for males and females in the current study (Table 1) were in agreement with Ismail *et al.*, (2011) for Desert goat in Darfur.

The weaning age and weight are dependent on the individual growth performance before weaning and factors affecting it, beside the type of production. Therefore, the decision on when to wean should be determined by dam body condition, feed availability and kid's growth rates. These factors change every year, so the ideal weaning date cannot be set. In case of the study area, natural pasture, the mother's condition and nutrition determines the age of weaning. The kids in the current study, therefore, weaned at four months old depending on the condition of the pasture during the year of the experiment, but it was observed that by the end of the third month there was a sharp decline in daily growth and that may be due to the condition of goats. However, the current study found that the overall average weaning weight (4th month) was 11.92 ± 1.9 kg (ranging 8.50-14.95 kg). Male kids showed significantly higher ($P < 0.05$) body weights (12.95 ± 1.8 kg) at weaning compared with females (10.69 ± 1.3 kg). Also single kids showed significantly higher ($P < 0.01$) body weights (12.89 kg) at weaning compared with twins (10.61 kg). The age of weaning in this study is different from the previous studies that determine the age of weaning at three months and therefore the comparison of weaning weight in this study with the previous studies is very difficult. However, the weight at weaning in this study is higher than that reported by Ismail *et al.*, (2010) in Desert kids at the same age which was 10.5 ± 0.05 kg. Bushara *et al.*, (2011) reported weaning weights as 10.84 ± 0.34 and 8.41 ± 0.19 kg for Desert and taggar goats, respectively. The current results are also in agreement with that reported by Mavrogenis *et al.*, (1984) for Damascus goats in Cyprus. Leas and Peters (1995) in a comparative study of performance of Egyptian goat breeds (Baladi, Zaraibi and Damascus) stated that birth litter size and sex of kids significantly ($P < 0.05$) affected the weaning weight. Also Al kass *et al.*, (1995) reported that males were significantly ($P < 0.01$) heavier than females for native Iraqi goats and their crosses with Sannen and Damascus goats. The same authors (1999) reported a significant ($P < 0.01$) effect of the type of birth on weaning weight. On other hand, Morand (1997) and Lu and Potchoiba (1988) reported that weaning as a procedure of stopping suckling will result in a shock to kids growth rate.

Table 1: Pre-weaning performance (kg) of F1 kids (Damascus and Desert) in North Kordofan-Sudan

	Age (month)	Average (overall)	Male	Female	Single	Twins
Birth	Weight	2.44± 0.48	2.74±0.48*	2.04±0.14	2.62±0.46*	2.27±0.16
	N	43	25	18	20	23
1	Weight	5.03± 0.98	5.54±0.81*	4.6±0.48	5.48±0.61*	4.52±0.46
	N	33	19	14	18	15
2	Weight	7.43± 1.1	8.03±1.1*	6.67±0.8	7.96±0.96*	6.6±0.78
	N	31	18	13	17	14
3	Weight	9.88± 1.5	10.6±1.4*	8.89±1.1	10.62±1.3*	8.79±1.04
	N	31	18	13	17	14
4	Weight	11.92±1.9	12.95±1.8*	10.69±1.3	12.87±1.7*	10.61±1.4
	N	31	18	13	17	14
W/Weight		11.92±1.9	12.95±1.8*	10.69±1.3	12.87±1.7*	10.61±1.4

Pre-weaning daily weight gains

Table (2) shows that the average daily gain during the first month in the crossed kids was 85g (ranging 70-120 g). The study observed that there was significant differences ($p < 0.05$) in daily gains according to sex. Males gained heavier weights at all ages. Also single kids gained significantly ($P < 0.05$) heavier weights at all ages.

However, the overall pre-weaning daily gain in the current study is widely differ from that reported by Bushara (2017) in Desert goats of South kordofan, and also higher than that reported by El-Abid *et al.*, (2008) for the Nubian kids.

Table 2: Pre-weaning daily gains (g) of F1 kids (Damascus and Desert) in North Kordofan-Sudan

Age	Mean	Mini.	Max.	Males	Females	Single	Twins
1	86.3	70	120	92*	78	93*	76
2	80	50	100	84*	75	87*	72
3	82	50	110	89*	74	89*	75
4	68	40	100	76*	60	76*	60
PADWG	80	56	107.5	85*	72	86*	71

*=($p < 0.05$) **=($p < 0.01$),

Post-weaning performance of crossed kids in North Kordofan- Sudan

The post-weaning period is characterized by a decrease in growth rate, and the kids start to depend on their self to meet their nutrients requirements. Therefore, weight gain is much lower compared to the pre-weaning growth period. In the current study, the performance of kids up to the age of maturity was affected by sex and litter size (Table3).

The study observed a sharp decline in the daily gain rate since the fourth month and reached its peak in the fifth month old, and then gradually regained growth from six month until the eighth month. This is may be due to weaning shock and it occurs as a result of the newborn kid dependence on itself in nutrition, and also may be due to pasture deterioration. However, the mean post-weaning average daily weight gain, up to one year old, was 55.13 and 38.8 g for males and females, respectively.

Wilson and Clarke (1975) reported an average daily weight gain of Southern Darfur indigenous goats as 67.0 g/d up to six month s of age. Moreover, Ageeb (1992) showed that the growth rate of the Southern Kordofan Baggara goats was 40.8 ± 18.1 g/d and 38.6 ± 22.7 g/d for ages up to 6 months and 9 months, respectively. For Indian Jamnapari goat, Khan (1979) reported a post-weaning growth rate of 42.0 g/ d and 32.0 g/d for male and female kids, respectively. In the same study the growth rate from 3 to 12 months of the single born males and females were 31.0 and 24.0 g/d, respectively, and for twin born males and females were 41.0 and 32.0 g/d, respectively. Mahagoub and Lodge (1998) studying the production performance of Batina goats of Oman, showed that the post-weaning growth rate of this breed was 102.0 g/d.

Table 3: post-weaning performance (kg) of F1 kids (Desert and Damascus) in North Kordofan- Sudan

Age (month)	Overall	Min.	Max.	Males	Females	Singles	Twins
weanig wt.	11.92±0.91	8.5	14.95	12.95±0.86**	10.69±0.73	12.89±0.77*	10.61±0.43
5	12.95±0.36	9.68	16.48	14.29±0.75*	11.53±0.41	13.96±0.59*	11.74±0.33
6	14.39±0.76	10.78	18.24	15.84±1.7**	12.85±1.5	15.51±1.3**	13.03±1.1
7	16.03±0.44	12.15	20.46	17.61±0.51*	14.33±0.42	17.29±0.55*	14.48±0.39
8	17.62±0.42	13.16	22.41	19.16±0.51**	15.78±0.41	18.92±0.62*	15.83±0.33
9	18.85±0.49	14.06	24.44	20.46±0.61**	16.94±0.45	20.23±0.66*	16.92±0.33
10	19.92±0.48	15.10	26.63	21.54±0.60*	17.98±0.41	21.3±0.64*	18.03±0.39
11	21.83±0.49	16.20	26.80	22.54±0.60*	18.99±0.46	22.28±0.67*	19.06±0.39
12	23.04±0.48	17.23	28.04	24.25±0.58*	20.86±0.48	23.95±0.67*	20.97±0.40

** = (P<0.01),* = (P<0.5)

Table 4: post-weaning daily weight gains (g) of F1 kids (Desert and Damascus) in North Kordofan- Sudan

Age, month	Mean	Min.	Max.	Male	Female	Single	Twine
5	40	30	50	44*	36	42*	37
6	55	40	66	65*	41	64*	43
7	61	42	79	68*	49	69*	47
8	51	39	68	62*	48	61*	44
9	44	35	59	56*	34	55*	36
10	39	31	53	51*	35	49*	34
11	38	32	51	48*	33	46*	30
12	39	32	50	47*	34	46*	32
PWADWG	45.9	35.16	60	55.13*	38.8	54*	37.9

** = (P<0.01), * = (P<0.05, NS= no sig)

Kids Mortality Rate

The mortality rate of kids during the first four months post kidding was 27.3%. The mortality rate in this study was due to many factors such as diseases, inadequate nutrition and other individual factors. These results were complying with many authors (Khan 1979; Vihan 1979 and Nair, 1979). Khan (1979) studied the kid's mortality for Jamnapari goats of India and reported that, the pre-weaning mortality was higher in the kids having low birth weight and the mortalities were 14.92%, 10% and 8.49%, for pre-weaning, post-weaning and adults, respectively. Vihan (1979) investigated the common causes of mortality in kids and their control, showed that 50 % of the deaths happened in the first month and about 25% during the first week of age, Nair (1979) found a mortality rate of 5.06% and 6.05% for Malabari adult males and females, respectively.

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