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Evaluation of Baggara Calves Performance Under Traditional System in West Kordofan State, Sudan

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ABSTRACT

This study was conducted to evaluate performance of Baggara claves in West Kordofan State, Sudan. Forty eight calves were selected from the herd of Baggara cattle. The calves were weighed and divided into four groups A, B, C and D, each group comprised of (12) calves according to their dams parity order as first, 2nd , 3rd and 4th parity in complete randomized design. F test and Duncan's were used for data analysis and mean separation. All calves were raised on natural grazing. Analysis of variance showed that calves birth weight was significantly ($p<0.05$) affected by parity, with mean birth weights were 21.33 ± 2.65, 23.03 ±2.35 , 26.82 ± 4.15 and 28.30 ± 3.40 Kg for calves born in group A, B, C and D respectively. Calves birth weight significantly ($p<0.05$) affected by gender of claves. Male calves scored higher weight compared with female calves, male (31.50±1.51kg) and female (25.25 ±2.63kg) calves had high weight at birth. Weaning weight, daily gain, growth rate and mortality rate were significant ($p<0.05$) influence by parity and calves gender. The high ($p<0.05$) growth rate was obtained for calves born in group D. In conclusion, Baggara calves that depended on natural grazing showed better production and reproduction performance with advance of parity order.

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Introduction

The purpose of a livestock system is to produce a quantity of quality products with maximum efficiency. A component in achieving this goal is to improve cattle genetically in the areas of quantity, quality and efficiency [1]. The higher demand of milk and meat in the local as well as foreign markets focused the cattle enterprise extremely belong to the vulnerable group of smallholder in the existing socio-economic condition of the country. The most of Sudanese cattle breeds are kept by nomadic or semi-nomadic people. Baggara cattle are owned by traditional and transhumant tribes raised their cattle under traditional farming condition, which fluctuating from season to season according to rain fall during years which reflect negatively on animal productivity. Cattle- herders, migrating seasonally between grazing lands in the wet season and river areas in the dry season [2]. So animals move long distances researching for good pasture and lost more energy which declines its production during year [52]. The main factors influencing reproductive efficiency in cattle includes age at calving, parity, indiscriminate mating, poor fertility of bulls and nutrition [3]. Better reproductive performance and milk production increased with increasing age of the dam which has great effect on birth weight and all growth traits. Nutrition is has been mentioned to be one of the most important factors influence cattle performance in the tropics. Since that the reproductive performance was a complex of a biological and physiological process leading to multiplication in addition to the attainment of other animal products like milk, meat and other [4]. In general in the Western Sudan, the productivity of pastoral cattle was higher than that of sedentary herds, but the differences are not significant, and this due to poor calving rates, slow growth rates and high death rates [5]. Livestock were grazing predominantly and extensively on the unimproved native pastures and crop residues. Consequently, the problem of poor nutrition becomes exacerbated in the dry season when the animals are subjected to nutritional stress because the feed resources are senesced and in short supply leading to lowered animal productivity [6]. Unavailable of feed supply limit the expression of production and reproduction potential of indigenous cattle. Therefore, it is of vital importance to assessment productivity of the Baggara cattle that running in pasture depending on natural grasses without any supplemented or additional feed stuff. However, cattle in the tropics produce, on average, lower milk yields, birth weight and shorter lactations than cattle in temperate zones; the difference is caused by both genetic and non-genetic factors [7]. Comparison of Baggara cattle based on the effect of season of birth, parity number, live weight, growth rate and weaning weight, however, are not available in the literature. So the main objective of the

present study was to evaluate the calves performance kept under traditional in tropic conditions in West Kordofan state, Sudan.

Materials and Methods

Study Area

The experiments were conducted in Elfula area, West Kordofan state (9-12o and 12-30o N, 15-27o and 30o E). The study has been done during the rainy season (May-October), cool dry (December-February) and hot dry season (March-May). Mean 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 450-650 mm, with peak rain in August, with relative humidity of 35% rise 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 [8].

The dominant vegetation varies with soil and rainfall patterns, with mixture of grasses and herbs with scattered shrubs and browsing trees, common grasses are Loudetia togoensis (Gaw), Zornia glochidiata (Luseig), Echinocholoa colonum (Differa), Tuibulus pentanclvus, Daetgiloctenium aegyptiaca and Cenchrus biflorus .Common leguminous trees are Albizia amara (Arad), Adansonia digitata (tabaldi), Zizphus spingchrista (Sidr), Balanites aegyptiaca (Hegleed), Tamavindus indica (Aradeb), Acacia seyal (Taleh), Acacia mellifra (keter) and Acacia Senegal (Hashab) [9]. The natural grazing was subjected to chemical analysis according to [10]. The grasses also were subject to approximate analysis twice, in wet and dry season (Table 1).

Table 1: Chemical Analysis of Some Grasses in Wet and Dry Season During Study Period

Sample	DM%	Fat%	CP%	CF%	Ash%	Ca%	P%
Wet Season							
Tribulus terrestris	93.16	1.68	28.44	34.23	6.27	0.2252	2.35
Zornia glochidiata	93.69	1.3	28.88	31.85	7.58	0.1098	0.70
Dactyloctenuim aegyptium	94.05	0.68	13.48	35.01	7.46	0.1320	0.65
Eragrostis tremula	94.69	1.20	13.77	30.44	6.69	0.138	0.85
Cenchrus biflorus	94.67	0.89	18.03	35.29	8.84	0.1332	0.7
Dry Season							
Tribulus terrestris	90.92	1.41	16.5	22.91	7.30	0.80	0.15
Zornia glochidiata	92.48	1.1	22.53	19.69	7.04	0.55	0.09
Dactyloctenuim aegyptium	93.22	2.18	10.54	16.58	9.48	0.65	0.09
Eragrostis tremula	94.22	2.27	9.38	5.44	6.03	0.45	0.12
Cenchrus biflorus	93.16	1.39	14.20	14.10	9.57	0.45	0.12

Where DM (dry matter), CP (crude protein), CF (crude fiber), Ca(calcium) and P(phosphorus).

Experimental Animals and Management

Forty eight pregnant Baggara cow were selected from the herd (1-4 parity orders) from nomadic flock to study their born calves. The cows were settling around Elfula area. The cows were followed from last trimester of pregnancy to birth. The target born calves were divided into four groups each group comprise of (12) calves according to number of parity of their dams as first, second, third and fourth parity. Animals were eared tagged, treated against parasites and vaccinated against disease (foot and mouth, Anthrax and Hemorrhagic Septicemia). The newly born calves were left to suckle their dams freely up to their first 7 days after birth and then were allowed free grazing (from 8.00 am to 6.00 pm) on an early pasture. The four groups were housed in partially shaded pens, constructed from traditional local material.

Data Recording

Calves body weight was closely followed, the calves were weighed at birth then after one month intervals up to age of weaning (210days).The calves live body weight determined by measuring the girth width using a weight band.

Statistical Analysis

Analysis of variance procedures using the General Linear Model (GLM) applicable to the complete randomized design were used. Techniques of the statistical analysis were conducted using Statistical Package for the Social Sciences, software package [11]. To identify mean significant differences, Duncan's multiple range test (DMRT) was used.

Results

Influence of parity and sex of calves on birth weight

The data on birth weight of calves as affected by parity and sex of calf are shown in (Table 2). Parity and calf sex had significant ($p<0.05$) influence on calf birth weight. Calves of parity fourth had significantly ($p<0.05$) maintained highest body weight 28.30±3.40 kg compared to with other parties which maintained lightly body weight as 21.33 ± 2.65, 23.03 ±2.35 and 26.82 ± 4.15 kg for 1st , 2nd and 3rd parity respectively. Males in all groups were significantly ($p<0.05$) heavier than females. Calf's males from cows with 4th parities were heavier at birth 31.50±1.51 kg than males in other parties with value of 23.86±1.46 and 30.00±1.41 kg. Male in 1st primiparous cow scored the lowest weight at birth 21.33 ± 2.65 kg. Female born to 4th parity significantly ($p<0.05$) recorded heavier birth weight 25.25 ±2.63kg, where female born from first primiparous animals scored lowest weight 18.50±1.87kg. Generally male calf had highest body weight 26.63±1.68 kg compared with female 22.08±2.20 kg.

Table 2: Influence of Parity And Sex on Calf Birth Weight

Variables	No. of calves	calf birth weight/kg		
Animal Group				
1st 21.33 ± 2.65B	12	1st parity		
2nd 23.03 ±2.35B	12	2nd parity		
3rd 26.82 ± 4.15A	12	3rd parity		
4th 28.30 ± 3.40A	12	4th parity		
Sex of calves				
	No. of calves	**Male**	**No. of calves**	**Female**
1st parity	6	21.17± 2.32^{Ca}	6	18.50±1.87^{Cb}
2nd parity	7	23.86±1.46^{Ba}	5	20.20±1.48^{Bb}
3rd parity	4	30.00±1.41^{Aa}	8	24.38 ±2.83^{Ab}
4th parity	8	31.50±1.51^{Aa}	4	25.25 ±2.63^{Ab}

^{ABC} Values in same column with different superscripts differ at P<0.05 also ^{ab} values in same row with different superscripts differ at P<0.05

Effect of Parity and Sex on Calf Weaning Weight

Parity and sex of calves significantly (p<0.05) influenced weaning weight, weight gain and daily gain (Table 3). Calves weaning weight from group 4th parity weaned at 7 months were statistically heavier (69.30 kg) compared with calves in 1st (65.91 kg) and 3rd parity (66.09 kg).

Second parity calves showed lightest weaning weight (64.08 kg). Calf's weight gain and daily gain were statistically (p<0.05) effected by parity (Table 3). Calves born in 1st parity cows showed higher weight gain with high daily gain (44.58kg vs. 212.29 g). Calves born in third parity had scored lowered weight gain and daily gain as 39.27 kg and 187.00 g/day respectively. Male calves born in 4th parity were recorded highest weaning weight 70.38± 2.72 kg and male calves born to 1st parity cow's second lowest weaning weight 64.60 ± 3.36 kg, but they secured second body weight gain and daily gain as 43.43±2.34 kg vs206.81±1.46 g/day. Highest (p<0.05) weight gain and daily gain observed by male calves born to 2nd parity animals. Female calves born to 4th parity scored highest weaning weight 66.00± 1.41kg compared with female calves born other parities, the respectively value was 64.14± 5.58, 62.00± 2.37 and57.20±2.17 kg for female calves born to 3rd , 1st and 2nd parities respectively. Female calves born to 1st parity recorded higher daily body weight gain 207.14±1.45g/day and lowered one was observed by 2nd parity heifers 176.19±1.27g/day (Table 3).

Table 3: Weaning Weight as Affected by Parity and Calves Sex

Animal Group	No.	weaning weight/kg	body weight gain/Kg	daily weight gain/g/day
1st parity	11	65.91 ±5.24^{B}	44.58 ±3.85^{A}	212.29± 18.38 ^{A}
2nd parity	12	64.08 ±4.39^{B}	41.05±3.47 ^{B}	195.48 ±18.09 ^{B}
3rd parity	11	66.09 ± 6.48^{B}	39.27 ± 4.73^{C}	187.00 ± 21.49^{C}
4th parity	10	69.30 ±3.45^{A}	41.00 ±1.83^{B}	195.24± 8.53 ^{B}
Type of sex				
	No.		Male	
1st parity	5	64.60 ± 3.36^{B}	43.43±2.34^{B}	206.81±1.46^{B}
2nd parity	7	69.09± 1.60^{A}	45.23±1.27^{A}	215.38±1.23^{A}
3rd parity	4	69.50± 7.23^{A}	39.50±2.57^{C}	188.10±3.45^{C}
4th parity	7	70.38± 2.72^{A}	39.88±±1.34^{C}	185.14±1.67^{C}
	No.		Female	
1st parity	6	62.00± 2.37^{AB}	43.50±1.75^{A}	207.14±1.45^{A}
2nd parity	5	57.20±2.17^{C}	37.00±2.04^{C}	176.19±1.27^{D}
3rd parity	7	64.14± 5.58^{A}	39.76±2.54^{C}	189.33±1.38^{C}
4th parity	3	66.00± 1.41^{A}	40.75±3.45^{B}	194.05±2.57^{B}

^{ABCD} Values in same column with different superscripts differ at P<0.05

Effect of Parity and Sex of Calves on Growth Rate

The effect of parity order and sex of calves on growth rate for seven months were demonstrated in (Table 4). Parity order showed significant ($p<0.05$) effect on growth rate during the study period (0- 240 days). Calves born in 4th parity scored high weight during all period. Where 1st parity born calves recorded lower weight compared with 2nd parity calves during 60-120, 120-180 and 180-240 days. The respectively weight were 45.91±4.57, 58.82±5.22 and 65.91±5.24 for the 1st parity calves and 44.00± 7.17, 57.25±3.86 and 64.08±4.39 for the 2nd parity calves respectively.

Sex of calves have exerted significant ($p<0.05$) effect on growth rate (Table 4).The data indicated that males calves recorded higher growth rate than females calves. In all stages of growth males animals born to 1st parity showed lowered weight gain (29.20±1.92, 43.20±2.86, 56.80±2.95 and 64.60±3.42kg), where females born from 2nd parity animals also recorded lower weight during 120-180 and 180-240 days (47.60± 1.67 and57.20±2.17 kg). Males and females animals born to 4th parity were significantly ($p<0.05$) higher during study period compared with all calves born to other parities.

Table 4: Influence of Parity And Sex of Calves on Growth Rate/Kg

Animal Group	No.	0 – 60 day	60 – 120 day	120 – 180 day	180 – 240 day
1st parity	11	34.27 ± 3.26^{B}	45.91 ± 4.57^{B}	58.82 ± 5.22^{AB}	65.91 ± 5.24^{B}
2nd parity	12	34.83 ± 3.71^{B}	44.00 ± 7.17^{B}	57.25 ± 3.86^{B}	64.08 ± 4.39^{BC}
3rd parity	11	39.00 ± 4.79^{A}	50.91 ± 5.02^{A}	61.55 ± 6.42^{A}	66.09 ± 6.48^{B}
4th parity	10	41.10 ± 4.33^{A}	52.00 ± 3.9^{A}	62.70 ± 3.53^{A}	69.30 ± 3.45^{A}
Sex of calve					
Male					
1st parity	5	29.20 ± 1.92^{BC}	43.20 ± 2.86^{B}	56.80 ± 2.95^{AB}	64.60 ± 3.42^{B}
2nd parity	7	30.71 ± 1.11^{B}	42.86 ± 1.68^{B}	53.57 ± 1.27^{B}	65.29 ± 1.60^{B}
3rd parity	4	38.25 ± 1.26^{A}	49.250 ± 5.56^{A}	60.25 ± 5.12^{A}	69.50 ± 7.17^{A}
4th parity	7	36.86 ± 91.95^{A}	48.57 ± 2.76^{A}	58.43 ± 3.26^{A}	70.38 ± 2.89^{A}
Female					
1st parity	6	25.18 ± 1.47^{B}	36.83 ± 1.17^{C}	48.67 ± 2.58^{C}	62.00 ± 3.66^{C}
2nd parity	5	26.60 ± 3.36^{B}	36.20 ± 1.10^{C}	47.60 ± 1.67^{C}	57.20 ± 2.17^{D}
3rd parity	7	30.57 ± 3.55^{A}	43.71 ± 2.812^{B}	53.29 ± 4.23^{B}	64.14 ± 2.58^{B}
4th parity	3	30.67 ± 4.04^{A}	45.00 ± 4.58^{A}	55.33 ± 2.89^{A}	66.00 ± 2.65^{A}

^{ABCD} Values in the same column with different superscripts differ at $P<0.05$

Mortality Rate As Affected By Parity Order and Sex of Calves

Parity number showed significant ($p<0.05$) effect on mortality rate (Table 5). Whereby 1st, 2nd and 3rd parities recorded lowered mortality (8.33%), high mortality rate was observed in 4th parity cows with 16.6%, with overall mean mortality rate of 17.32%. Sex of calves have exerted significant ($p<0.05$) effect on mortality rate (Table 5).The data indicated that female and male calves had different mortality rate, where male recorded 12 % and female with 8.70 %.

Table 5: Effect of Parity Order and Calves Sex on Mortality Rate

Variables	No. of calve born	No. of calves died	Mortality rate %
Animal group			
1st parity	12	1	8.33
2nd parity	12	1	8.33
3rd parity	12	1	8.33
4th parity	12	2	16.6
Sex of calve			
Male	25	3	12
Female	23	2	8.70

Discussion

Effect of Parity and Calves Sex on Birth Weight

The mean of birth weight of Baggara calves was lighter than purebred Brahman cattle calves as 29.6kg
And larger than Fogera calves of 20.7±0.11 kg. The effect of birth weight by parity agreed with .The birth weight of calves is mostly affected by the dam's age at the first mating, at calving and the calf sex [13-16].

Reported that effect of parity on birth weight was highly significant, and the birth weight was lowest calf's birth weight produced by dams aged 2 years, increased rapidly at 3 years of age .Explained that calves born from primiparous dams were significantly lighter than those calves born from multiparous dams. This increase happened gradually until dams reached 5-6 years of age and then birth weight decreased until 9-11 years of age. However. Found that parity did not influence birth weight, contrast to these. Mentioned that dam parity and age considered as sources of variation in birth weight. Also indicates that 5 to 9 years cows calf heavier calves than first parity cows and too old cows. suggesting that bigger cows are likely to produce heavier calves. As cited, the birth weight of a calf ranges between 5 to 10% of the weight of its dam [17- 24].

The results of [25]. Demonstrated that the relationship between calf birth weight and his dam weight is more important for predicting calving difficulty than the calf birth weight itself. This different could be attributed to a good maternal environment provided by mature dams to the newly developing fetus, also could be due to competition for nutrients between fetal development and maternal growth which is high in younger dams than older ones. These variations might attribute to many factors as dam size, temperature and maternal nutrition; however different size of breeds may have contributed to the differences in calf birth weights.

It was noticed that males were heavier in birth weights than female calves. This is in agreement with [13]. And Moaeen-ud-Din and. Who mentioned that male calves weight approximately 5 to 8% more at birth than female calves. This could be due to longer gestation time of male calves or high androgen concentrations in male fetuses. Development of the male reproductive tract administered by testosterone secretion from the Leydig cells begins as early as day 42 of gestation [26,27]. This may demonstrated the higher birth weight of male calves compared to female calves as reported in the present study, which agreed with. who showed that both males bon as singles and males born as twins had higher birth weights than females-singles and females-twins by 9.8 and 7.9%, respectively.

Effect of Parity Order and Sex on Weaning Weight

The weaning weight of Baggara calves was lower than that comfirmed by Who reported that weaning weight was 91.25kg and 78.54 kg for Dajal and Dhanni breed respectively. This variation may be associated with differences in management practices and geographical differences as well as maternal ability of the breeds used in each study.In this study it was observed that calves weaning weight increase with increasing parity order, which agrees with [15-28]. Who stated that the weaning weight of calves increased up to 5 years of the dam's age, which means up to the third parity.

reported that dam parity number influences were positive sources of variation in weaning weight, pre-weaning average daily gain, and one year weight. Similarly [29]. revealed that in the comparison of calves from older dams with younger dams are expected to reached heavier weaning weight; however, this condition was strongly due to well developed mammary tissue thus better maternal environment in terms of milk for the suckling calf. In cattle and other mammals the calf and the dam contribute to the weaning weight. Growth during the suckling period is affected both by the calf which growth is measured and by the dam which provides the developmental environment.

On the other hand [30]. Discussed that weaning weight positively influenced by early parturition, because calves had a longer period of growth before the common weaning date [29]. Saied that heifers born in earlier time gave birth to lighter calves in their first calving season, with heavier weaning weight contributed to the increased age at weaning. Generally, cows with small age in the earliest calving had an increase in weaning weight that amounted to the production of an extra calf during their lifetime.

This viewed a large picture of financial advantage for the cow-calf producer and demonstrates why it is important for cow-calf producer to ensure that their replacement heifers will conceive early. Parity of dam influence on weaning weight could be related to milking and mothering ability of the dams. Less milk production by younger and older cows can bring a calf with lower weaning weight. The lighter weaning weight for calf' that from cows calving twice may be due to good nutritional requirement available to dams for their own growth, lactation and body maintenance that in turn may not be fulfilled only by grazing. However, older cows, produced small amount of milk due to their reduced ability to cope up with nutritional and other stress factors associated with aging, resulting of lighter calves at weaning. The effect of parity in the study is similar with earlier reports [15].

Influence of Parity Order and Sex on Growth

The study showed that parity order had affected on growth rate. This result agreed with [13,15,31]. Who reported calf parity number had significant influence on growth rate of crossbreds in 6, 9, 12, 15 and 18 months of age. The results revealed that calves born to later parity dams scored higher weight than calves born to early parity dams. While Moaeen-ud-Din and Reported that calves born to first and later parity dams had similar pre-weaning growth rate and post- weaning growth rate. On the other hand, the data of the present study revealed that male's calves recorded higher growth rate than female's calves in all stages of growth. It was noticed that males had heavier weaning weights than female calves. Our finding also corresponds with Moaeen-ud-Din and [26]. Difference at birth between the male and female was eliminated at weaning may be due to good husbandry and management offered to female calves. However [13,15]. Reported a significant effect of sex on weaning weight of calves [32]. Reported calf parity number had significant effect on the average daily growth rate of Friesian x Bunaji crossbreds at 6, 9, 12, 15 and 18 months of age.

Average daily weight gain of Belgian Blue calves at 9 and 12 months was 0.52 and 0.34kg respectively. However [33]. Argued average daily gain at as 3(0.39 g), 6(0.43 g), 9 (0.40 g) and 12(0.40 g) months. [15,13]. documented that parity had an effect on average daily body weight gain, the calves born from the seventh parity dams performed lower. This might be due to the old age of the dams that leads to reduction in milk production and that influence of the birth weight and subsequent growth of the calf.

Effect of Parity Order and Sex on Mortality

Prenatal mortality, varies widely among countries and among livestocks within the same country. Different factors have been connected with prenatal mortality of Holstein calves including sire, dam parity, sex, dystocia, season, and twinning. The result of this study found that the overall mean mortality rate was 17.32%. Result obtained here were higher than that mentioned by. 4.29%, and lower than that reported by (12.48%), while recorded that a dairy cows kept under relatively intensive conditions had mortality between 1-5%, however, these information may be subject to

very large variations. Concerning the influences of dam nutrition and age on calf mortality, similar results were reported by That mortality rate decrease and lowered in dairy cows with access to pasture for grazing. Mortality rate in our study was in close agreed with the recent studies by [34,-41]. Registered a mean mortality rate of 5.6% in Danish dairy herds Reported a 3.8% mortality rate and he concluded that the herd level and contextual factors influencing the dairy cow mortality.

On other hand Revealed that primiparous animal when calved at smaller and younger age, prenatal mortality increased relative to the median age at first calving Found significant effect of parity on mortality rate, who reported that among calves 1 to 5 months old, being the offspring of a first-parity cow was associated with significantly higher risk of death compared with calves who were the offspring of third- or higher-parity cows. As cows with older age were at higher risk of dying Mortality rate should have been decreased with the decreasing proportion of older cows. The higher mortality in younger calves might be due to miss management and husbandry practices and their increased susceptibility to diseases and environmental stress than older animals [42-47].

From the present study it was observed that males had higher percentage compared to female's calves. Male calf showed maximum (12%) mortality than heifers (8.70%). This general picture agrees with [44-51].The mortality hazards were higher for cows with male calves than cows with female calves. Some researcher Concluded that male calves could be a risk factor for different reproductive disorders such as stillbirth and dystocia. The reason for this, that heifers were given more care due to their economic importance as compared male calf. Generally, increased mortality rate could be due to changes in animal's management, genetic changes, or ineraction of genetic and herd management changes.

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