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Impact of Sire Birth Weight on Dhofari Calves Growth Characteristics from the Salalah Livestock Research Station

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ABSTRACT

The present study was carried out to find the effect of sire birth weight on the Dhofari calf's breed growth traits of birth weight, weaning weight, yearling weight, pre-weaning, post-weaning daily gain, dam gestation length and calving ease score . Seasonal interaction with the sire birth weight effect on calf's growth traits was also investigated. Growth traits of calf's were classified to seasonal (cold, hot and temperate) interaction with sire birth weight class. Data of different weight records of 558 calf's' and their relative dams sired by 40 Dhofari bulls breed from Salalah Livestock Research Station were used in this study. The different calf's growth traits were classified into three classes according to sire birth weights (high, medium and low). The data were analyzed by multivariate General Linear Model (GLM) using SPSS. Analysis showed significant (p<0.05) effect of sire birth weight class on all calf's growth traits. Calf's of high class sire birth weights proved to be heavier for all growth traits than sired by medium and low class bulls. There was a strong positive significant (p<0.01) correlation between sire birth weight class and all calf's growth traits with the highest being with calf's birth weight. The interaction between season and sire birth weight class showed significant (p<0.05) effect on calf's pre-weaning and post weaning daily gain during the temperate season but none (p>0.05) for the other growth traits of birth weight, weaning weight and yearling weight. Heavier calf's sired by high sire birth class had a significant (p<0.05) longer dam gestation length than those of low class sire birth weights. There was a significant (p<0.05) correlation between sire birth weight class and gestation length of the dam. However, there was no significant (p>0.05) effect of calf's sex on the dams gestation length. Analysis showed that dams sired by high sire birth weight class had heavier calf's and this had a significant (p<0.05) effect on the dams calving ease of score in comparison to dams sired by medium and low sire birth classes.

Key words: Sire birth weight, growth traits, correlation, season, gestation length, calving ease score

INTRODUCTION

Dams sired by different, pre-categorized birth weight sires and their effect on calves growth traits and calving difficulty was documented in literature (Bellows *et al.*, 1971; Meijering, 1984; Naazie *et al.*, 1989). Dams calving difficulty was proved to be strongly related to calf size which is the most important factor affecting calving ease (Rutter *et al.*, 1983). The Dhofari cattle breed which is indigenous cattle, located in the south region of Sultanate of Oman was and still used for meat and milk production. Little is known in literature about its economic potentials. However, variations of meat and milk production been documented and programs of meat and milk traits

improvements through selection implemented at Salalah live stock research station (MoAF., 2011). Insemination strategy for the purpose of breed improvement is based on selection of superior male calves breeding values pays little attention to factors such as sire birth weight class and dam calving ease. Farmers and cattle keepers in Oman do efforts to upgrade their indigenous cattle production through crossing with other breeds such as Jersey and hybrid Friesian which elevated their dams calving difficulty and high risk of calf loss. Therefore, this study investigated the effect of sire birth weight class (high, medium and low) on calves growth traits and dams calving difficulty to have an idea of the potential aspiring future for improvement and risks of maybe crossing programs of the Dhofari cattle breed.

MATERIALS AND METHODS

Data collection and experimental procedure: Weight records (birth weight, weaning weight, yearling weight, pre-weaning and post weaning daily gains) of 558 Dhofari calf's and parturitions sired by 40 Dhofari bulls from Salalah Livestock Research Station collected from 1995-2013 in the south region of Sultanate of Oman. In addition, factors records of season (cold, hot and temperate) and sex were also provided. Calf's weights were taken by means of automatic digital weighing scale (Iconix, New Zeland) within 24 h of parturition for birth weights and the rest of growth traits. Weights of calves were sorted into three groups based on the sire's birth weights. Sires with birth weight equal to and above 19.0 kg were classified as (High), from 15-18 kg as (Medium) and those equal to and less than 14.0 kg as (Low). Season effect as a factor was classified into three types according to the temperature of Salalah city in Celsius. Temperatures equal to and below 28ºC were classified as (Cold), from 33-35ºC as (Hot) and from 29-30ºC as (Temperate). Data on temperatures was acquired from the directorate general of meteorology of Oman reports. Gestation lengths of dams were recorded and collected by calculating the difference in dates from parturition within 24 h and the last insemination date as some cows accepted service more than once. Calving ease scores of dams were determined by Snell scale (0 = normal, 100 = most difficult) explained by Tong *et al.* (1975, 1977) after being transformed from a score scale of 0-5 (0 = normal calving and 5 = very difficult).

Feeding and housing: Calves suckled colostrums for the first three to five days of their birth date and were kept in private pens, half shaded with one part concrete floor and the other was ground. The pens were facilitated with automatic water supply taps and feeders for hay and concentrates. After one week of their birth date calves were administered 100-500 g commercial concentrate per day per head (18% crude protein, 2.5% crude fat, 7% crude fiber, 5% ash, 0.9% calcium, 0.5% phosphorus and 11.5 MJ kg^{-1} ME energy). Water, Rhodes grass hay (*Chloris gayana*) and mineral blocks were given as *ad libitum*.

Statistical analysis: Data was statistically analyzed by multivariate analysis using the GLM procedure of SPSS (SPSS., 2010). The following general linear model was used for the studied growth traits:

$$Y_{ijkm} = \mu + a_i + b_j + c_k + e_{ijkm}$$

where, Y_{ijkm} = studied growth trait, μ = population mean, a_i = the effect of sire birth weight class ($i = 3$, ≤14, 15-18, ≥19 kg), b_j = the effect of season ($j = 3$: cold, hot and temperate), c_k = the effect of sex ($k = 2$: male, female) and e_{ijkm} = random error.

Duncan test (Duncan, 1955) was performed in the sub-group comparisons between means of the factors found to be significant.

Bivariate correlation using the Pearson as a correlation coefficient was performed between growth traits and gestation length and sire birth weight class (SPSS., 2010).

RESULTS AND DISCUSSION

There was (Table 1) a significant (p<0.05) effect of sire birth weight class (high, medium, low) on all growth traits (birth weight, weaning weight, yearling weight, pre-weaning and post-weaning daily gain) of the Dhofari breed calf.

High birth weight class sires produced heavier (p<0.05) calfs at birth, weaning, yearling, pre-weaning and post weaning daily gain (Table 1) than medium and low birth weight class sires. Dhofari calfs breed growth traits gave higher (p<0.05) weight percentage differences between birth, weaning and yearling weights by more than 15% that was found by others (Paputungan *et al.*, 2000) based on sire birth weight class.

There was a high positive (p<0.01) correlation between sire birth weight class and calfs growth traits with highest Pearson correlation coefficient was with calfs birth weight of 84% (Table 2). This indicates how strong can paternal effect on calfs growth performance in the Dhofari cattle breed as found by Bahashwan *et al.* (2015).

There was no significant (p>0.05) effect of season on the sire birth weight class to produce any difference in calfs growth traits of birth weight, weaning weight and yearling weight. However, sires that produced lower calfs pre-weaning and post weaning daily gain were affected significantly (p<0.05) by season (Table 3) as found by Bahashwan *et al.* (2015). Dhofari sire bulls performed well without any seasonal effect of hot, cold or temperate climates in terms of calf production which indicated the high adaptation ability of this breed to the environment. Duncan test between means of weights revealed that heavier calf weights of all growth traits were obtained during the cold and temperate seasons while, the lowest were during the hot seasons as similar results found by (Knapp *et al.*, 1940) in beef Shorthorn cattle breed.

Calfs produced by high sire weight class had a significant (p<0.05) higher calving ease score than medium and low sire weight class (Fig. 1). Heavier calf's dams from high sire birth weight

Table 1: Means and SE of calfs growth traits by sire birth weight class

Sires	BW	WW	YW	PRE	POS
High	21.38±0.18^c	96.45±1.18^c	180.79±2.58^c	715.05±10.91^c	299.25±11.89^c
Medium	16.87±0.08^i	81.38±0.64^i	154.74±1.37^i	614.33±5.75^i	228.09±6.28^c
Low	12.17±0.11^d	66.79±1.22^d	132.71±3.33^d	519.90±11.64^d	197.98±14.77^i

BW: Birth weight, WW: Weaning weight, YW: Yearling weight, PRE: Pre-weaning daily gain, POS: Post-weaning daily gain, Means within columns with different subscript letters are significantly different (p<0.05)

Table 2: Correlation of sire birth weight with calfs growth traits

Correlation parameters	Sire	BW	WW	YW	PRE	POS
Sire	1	0.840**	0.532**	0.415**	0.416**	0.238**
BW		1	0.651**	0.503**	0.515**	0.267**
WW			1	0.759**	0.986**	0.323**
YW				1	0.747**	0.450**
PRE					1	0.306**
POS						1

BW: Birth weight, WW: Weaning weight, YW: Yearling weight, PRE: Pre-weaning daily gain, **Significant highly positive correlation at 0.01

Table 3: Means and SE of calfs growth traits by season effect on sire birth weight class

Parameters	Cold	Hot	Temperate
BW			
H	21.70±0.30[c]	21.55±0.36[c]	20.95±0.30[c]
M	16.73±0.12[c]	16.83±0.14[c]	17.09±0.14[c]
L	12.20±0.16[c]	12.00±0.30[c]	12.19±0.20[a]
WW			
H	99.35±1.90[c]	93.35±2.32[c]	95.83±1.95[c]
M	82.64±0.97[c]	79.82±1.17[c]	81.50±1.11[c]
L	69.96±1.60[c]	62.57±3.02[i]	63.69±2.00[i]
YW			
H	183.45±4.26[c]	173.55±5.01[c]	183.32±4.20[c]
M	156.77±2.27[c]	144.68±2.71[i]	158.81±2.59[c]
L	136.72±4.54[c]	118.57±8.57[c]	132.63±5.67[c]
PRE			
H	739.38±17.93[c]	683.52±21.05[c]	713.63±17.71[c]
M	625.62±9.01[c]	599.63±10.77[c]	615.68±10.29[c]
L	550.00±15.15[c]	481.29±28.62[i]	489.75±18.93[i]
POS			
H	291.15±18.98[c]	249.38±22.30[c]	342.44±18.75[i]
M	222.12±9.08[c]	165.28±10.86[i]	297.18±10.37[k]
L	132.40±14.02[c]	201.29±26.50[i]	299.00±17.53[k]

BW: Birth weight, WW: Weaning weight, YW: Yearling weight, PRE: Pre-weaning daily gain, H: High, M: Medium, L: Low, Means within rows with different subscript letters are significantly different (p<0.05)
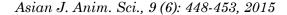
Table 4: Means and SE of dam gestation length by sire birth weight class and calf sex

		Confidence interval (95%)	
Parameters	Gestation length	Lower bound	Upper bound
Sire class			
High	287.79±1.14[c]	285.53	290.05
Medium	285.30±0.93[c]	283.46	287.15
Low	280.50±3.69[i]	273.18	287.82
Sex			
Male	285.40±1.01[c]	283.40	287.40
Female	286.78±1.02[c]	284.75	288.80

Means within gestation length column with different subscript letters are significantly different (p<0.05)

class had almost 56% of normal calving and 46% of calving difficulty, while dams sired by medium sire birth weight class had about 66% of normal calving and 34% of calving difficulty and dams sired by low sire birth weight class had only 22% chance of calving assistance and 78% unassisted normal calving (Fig. 1). There is a strong (p<0.01) negative correlation between sire birth weight and calving ease score in the Dhofari cattle breed as found by others (Tong *et al.*, 1988) in Charolais and Red Angus cattle breed and effect of sire birth weight was significant (p<0.05) for birth weight, calving difficulty score and frequency of dystocia (Cook *et al.*, 1993).

Gestation length was not affected by sex (p>0.05) as the difference was only 1-2 days between males and female calf's birth dates (Table 4) as similar results were found by others (Knapp *et al.*, 1940) in beef Shorthorn cattle breed. Analysis showed significant (p<0.05) effect of sire birth weight class on gestation length (Table 4). Duncan test showed that dams sired by high class sire birth weight had longer gestation length than low class sire birth weight by almost seven days. In milking Shorthorn cattle breed the gestation length was affected by birth weights in the total population (Knapp *et al.*, 1940), which indicated the strong positive correlation between the two and cows who tend to carry calves overtime would probably be sired by high sire class birth weight.
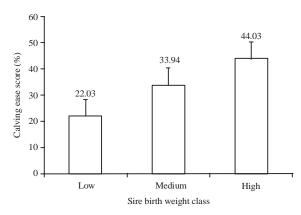
Fig. 1: Calving ease score by sire weight class

CONCLUSION

Dhofari dams calving ease can be affected by calf's size based on their sire birth weight class and this could affect the gestation length as well. Sex of calfs was not important for neither calving ease score nor gestation length. Season of calving had no effect as an interaction with sire birth weight class on calfs growth traits or gestation length but it would be preferred as a recommendation for the dams not to calve during the hot season as this would produce low calf growth traits.

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REFERENCES

Bahashwan, S., A.S. Alrawas and S. Alfadli, 2015. Growth traits and estimated heritability by variance component for Dhofari calf breed. Int. J. Scient. Res. Agric. Sci., 2: 39-44.

Bellows, R.A., R.B. Gibson, D.C. Anderson and R.E. Short, 1971. Precalving body size and pelvic area relationships in Hereford heifers. J. Anim. Sci., 33: 455-457.

Cook, B.R., M.W. Tess and D.D. Kress, 1993. Effects of selection strategies using heifer pelvic area and sire birth weight expected progeny difference on dystocia in first-calf heifers. J. Anim. Sci., 71: 602-607.

Duncan, D.B., 1955. Multiple range and multiple F tests. Biometrics, 11: 1-42.

Knapp, Jr. B., W.V. Lambert and W.H. Black, 1940. Factors influencing length of gestation and birth weight in cattle. J. Agric. Res., 61: 277-285.

Meijering, A., 1984. Dystocia and stillbirth in cattle-A review of causes, relations and implications. Livestock Prod. Sci., 11: 143-177.

MoAF., 2011. Directorate general of agriculture and livestock research: Agriculture and livestock research annual report. Ministry of Agriculture and Fisheries, Sultanate of Oman, pp: 1-207.

Naazie, A., M.M. Makarechian and R.T. Berg, 1989. Factors influencing calving difficulty in beef heifers. J. Anim. Sci., 67: 3243-3249.

Paputungan, U., M. Makarechian and M.F. Liu, 2000. Effects of sire birth weight on calving difficulty and maternal performance of their female progen. Asian-Aus. J. Anim. Sci., 13: 729-732.

Rutter, L.M., D.E. Ray and C.B. Roubicek, 1983. Factors affecting and prediction of dystocia in charolais heifers. J. Anim. Sci., 57: 1077-1083.

SPSS., 2010. SPSS User's Guide: Statistics (Version 19 Ed.). SPSS Inst. Inc., Chicago, IL. USA.

Tong, A.K.W., J.A. Newman, G.W. Rahnefeld and J.E. Lawson, 1988. The relationship of sire evaluations for ease of calving and birth weight. Can. J. Anim. Sci., 68: 557-560.

Tong, A.K.W., J.W. Wilton and L.R. Schaeffer, 1975. Evaluation of ease of calving for *Charolais sires*. Can. J. Anim. Sci., 56: 17-26.

Tong, A.K.W., J.W. Wilton and L.R. Schaeffer, 1977. Application of a scoring procedure and transformations to dairy type classification and beef ease of calving categorical data. Can. J. Anim. Sci., 57: 1-5.