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A PRELIMINARY STUDY OF DYSTOCIA IN BELGIAN BLUE X FRIESIAN HEIFERS AND OTHER CROSS BREEDS

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CONTENTS

SUMMARY

Calving data were collected on 17 Belgian Blue x Friesian (BBF), 10 Limousin x Friesian (LF), 8 Simmental x Limousin x Friesians (SLF) and 4 Charolais (C) heifers. The animals were bred by artificial insemination (AI) to one Limousin bull to calve at 2 years of age. The BBF and LF were bucket reared while the SLF and C were single-suckled to 7-8 months of age. Subsequently, all animals were treated similarly. Because of the small number of C involved, information on these was excluded in breed comparisons but was included for correlations between various traits. The main findings were:

- The mean liveweights at calving were 524, 521 and 583 kg for BBF, LF and SLF animals, respectively.
- Measurements taken during late pregnancy showed that SLF had significantly greater wither height, pelvic height, pelvic width, cannon bone length and hind-quarter roundness than the BBF and LF which were the same. These differences tended to reflect the liveweight differences recorded.
- Chest width of both the SLF and BBF was greater than for LF indicating, that despite having similar liveweights, the BBF had a wider chest than the LF.
- Gestation length was longer for the SLF (294 days) than for the other two breed types (290 days).
- There was no significant effect of heifer breed type on calf birth weight but when expressed as a proportion of dam liveweight, birth weights of the BBF were greater than SLF with no significant difference between the LF and the other two breed types.
- Calving difficulty score was significantly higher for BBF than for SLF with LF intermediate. The incidence of caesareans was 29%, 10% and 0% for the BBF, LF and SLF, respectively.

- Cow internal pelvic height was greater for the SLF than for the other two breed types but there was no effect of breed type on pelvic width. Pelvic areas were 272 cm^2 for BBF, 279 cm^2 for LF and 285 cm^2 for SLF. Those were not significantly different.
- There was no significant relationship between cow liveweight or external skeletal measurements and calf birth weight.
- Calf birth weight was positively related to cow internal pelvic width and pelvic area.
- There was a close relationship between the birth weight of calves and calf chest girth, hind-quarter roundness and calf head circumference.
- Calving difficulty score increased with increasing birth weight and particularly as birth weights expressed as a proportion of cow weight increased.
- Increased hind-quarter roundness and increased chest girth of the calf were associated with increased calving difficulties.
- Calving difficulty score decreased as cow size increased. All correlations between calving difficulty score and external skeletal measurements were negative but only those with withers height and pelvic height were significant.

INTRODUCTION

There are now 1.18 million suckler cows in Ireland and they account for 48% of the total cow herd (CSO, 1999). The proportion of continental breed crosses is continuously increasing and accounted for 52% of the suckler herd in 1998 (Drennan, 1999). Suckler beef producers in Ireland consider that ease of calving is an important consideration in suckler beef production. A recent evaluation (Amer, Crump and Simm, 1998) in the United Kingdom calculated that the cost for each calving type in excess of those of a "no assistance" at calving to be £7, £56, £95 and £281for calving types 2 (slight assistance), 3 (severe assistance), 4 (veterinary assistance) and 5 (caesarean section), respectively. The costings take into account stockperson hours, veterinary costs, reductions in fertility and those associated with probability of death of the cow or calf. It is thus important to avoid excess calving problems. There is a high incidence of dystocia in the Belgian Blue breed due to selection for double muscling and caesarean sections are now common practice (Murray et al., 1999). However, use of a Belgian Blue bull on other cow breed types (non double muscled) results in an incidence of difficult calvings similar to that recorded with continental sire breeds. The high incidence of calving problems arises in purebred double muscled Belgian Blues and thus, information is required on the incidence of calving difficulties in Belgian Blue cross females. In Ireland, the use of Belgian Blue sires has increased particularly on Holstein/Friesian cows in order to improve carcass conformation. Thus, artificial inseminations to Belgian Blue sires accounted for 12% of total inseminations in the first 9 months of 1999 (Department of Agriculture, Food and Rural Development, 1999). This has resulted in increased supplies of Belgian Blue crossbred heifers which may be used as suckler herd replacements. It was therefore, important to obtain information on the incidence of calving difficulties in Belgian Blue crosses compared to conventional crosses.

EXPERIMENTAL

Belgian Blue x Friesians (BBF) and Limousin x Friesians (LF) heifers were purchased in March at 2 to 3 weeks of age and were artificially reared. They spent the summer at pasture receiving 1 to 2 kg of supplementary concentrates at the start and again at the end of the grazing season. Simmental x (Limousin x Friesian) (SLF) and upgraded Charolais (C) heifers born in the period mid February to April were single-suckled until approximately 8 months of age having spent the period from April to November at pasture. All animals were fed similarly from 8 to 9 months of age and were bred using one AI Limousin bull to calve at approximately two years of age. The heifers received grass silage plus 1 to 2 kg of concentrates per head daily during their first winter, spent from April to November at pasture and were offered grass silage to appetite (plus a mineral/vitamin supplement) from housing until calving. The total number calving was 39 consisting of 17 BBF, 10 LF, 8 SLF and 4C. Liveweights were recorded regularly throughout from birth or purchase. Calving commenced in mid February. Anatomical measurements were taken on four occasions (November 17, December 17, January 22 and February 19) prior to calving. The measurements taken were withers height, pelvic height, chest width, chest depth, chest girth, pelvic width, length of back, cannon bone length and hind-quarter roundness. Internal pelvic measurements (width and height) were recorded using a Rice Pelvimeter on February 13. Pelvic area was calculated as the product of width and height. Calving difficulty score was assessed on a scale of 1 to 5 with 1 = no assistance, 2 = slight assistance, 3 = severe assistance, 4 = veterinary assistance, and 5 = caesarean section. Calf birth weight was recorded within 24 hours of birth. Other calf measurements taken at birth were chest girth, external pelvic width, hind-quarter roundness and head circumference. Because of the small number involved the C were excluded from the breed comparison but were included for correlations between various traits.

RESULTS

The mean liveweight of the SLF heifers during late pregnancy was significantly higher than the other two breed types which were similar (Table 1). Likewise, withers height, pelvic height, pelvic width, cannon bone length and hind-quarter roundness were all significantly greater for the SLF heifers than for the other two breed types which were similar. However, chest width of both the SLF and the BBF were significantly greater than for the LF. There was no difference between the SLF and BBF in chest width. There was no effect of breed type on chest depth, chest girth or length of back.

Table 1. Mean liveweight (kg) and [1]anatomical measurements (cm) recorded during late pregnancy.

	Cow breed type				
	BBF	LF	SLF	s.e.	F-test
Liveweight	507[a]	502[a]	571[b]	14.3	**
Withers height	121.4[a]	123.3[a]	127.4[b]	1.25	**
Pelvic height	129.8[a]	131.7[a]	135.6[b]	1.33	**
Chest width	46.3[a]	44.3[b]	47.9[a]	0.61	***
Chest depth	67.3	67.2	68.9	0.79	NS
Chest girth	189.3	187.0	189.4	2.90	NS
Pelvic width	48.2[a]	48.6[a]	51.3[b]	0.81	*
Length of back	116.7	116.9	120.1	1.68	NS
Cannon bone length	19.9[a]	19.9[a]	20.9[b]	0.30	*
Hind-quarter roundness	106.8[a]	105.3[a]	113.3[b]	1.60	**

[1]Anatomical measurements : mean of 4 records taken in late pregnancy
In this and subsequent tables means with different superscripts are significantly different.

Pre-calving and post-calving liveweights of SLF animals were greater than both the BBF and LF values which were similar (Table 2). Gestation length was greater for the SLF than for the other two breed types which were similar. There was no significant effect of dam breed type on calf birth weights. However, when calf birth weight was expressed as a proportion of cow liveweight, either pre- or post-calving, then the value was significantly greater for the BBF than for the SLF with no difference between the LF and the other two breed types. Calving difficulty score was significantly higher for the BBF than for the SLF with the LF intermediate and not significantly different from the other breed types. An examination of the proportion of calvings in the different calving score categories shows that the percentage of caesareans was 29, 10 and 0 for the BBF, LF and SLF, respectively (Table 3).

Table 2. Effect of cow breed type and calf sex on animal weights and calving performance.

	Cow breed type			Calf sex		[1]se		F-test	
	BBF	LF	SLF	Male	Female	Breed	Sex	Breed	Sex
[2]No. of animals	17	10	8	16	19				
Cow weight (kg) autumn	484[a]	484[a]	555[b]	506	509	14.9	10.8	***	NS
Pre-calving cow weight (kg)	524[a]	521[a]	583[b]	537	548	14.4	10.5	**	NS
Post-calving cow weight (kg)	438[a]	444[a]	513[b]	459	472	14.2	10.7	***	NS
Birth weight (kg)	45.0	42.9	44.0	45.4	42.5	1.67	1.22	NS	NS
[3]Calving score	3.6[a]	3.0[ab]	2.1[b]	3.5	2.3	0.39	0.28	**	
Gestation length (days)	290[a]	290[a]	294[b]	292	290	1.30	0.95	*	NS
Calf weight/pre-calving cow weight (%)	8.6[a]	8.3[ab]	7.6[b]	8.5	7.8	0.33	0.24	**	NS
Calf weight/post-calving cow weight (%)	10.3[a]	9.7[ab]	8.6[b]	9.9	9.1	0.46	0.35	*	NS

[1]Breed -for 8 animals Sex - for 16 animals
[2]Male (female) calves 7 (10), 5(5) and 4(4) for BBF, LF and SLF, respectively.
[3]Scale 1 (no problem) to 5 (caesarean section)

Table 3. Number (percentage) of calvings from each cow breed type in the different calving score categories.

	Cow breed type		
Calving score	BBF	LF	SLF
1	1 (6)	1 (10)	3 (37)
2	2 (12)	1 (10)	0 (0)
3	8 (47)	5 (50)	5 (63)
4	1 (6)	2 (20)	0 (0)
5	5 (29)	1 (10)	0 (0)
Total	17 (100)	10 (100)	8 (100)

Cow pelvic size measurements showed that pelvic height was significantly greater for the SLF than for the other two breed types (Table 4). However, there was no effect of cow breed type on either pelvic width or pelvic area.

There was no effect of cow breed type on calf chest girth, external pelvic width, hind-quarter roundness or head circumference.

Correlations

There was no significant effect of either cow liveweight or any of the external cow measurements on calf birth weight (Table 5). However, there was a significant positive relationship between calf birth weight and both internal pelvic width and pelvic area.

Table 4. Effect of cow breed type and calf sex on cow pelvic measurements and calf anatomical measurements.

	Cow breed type			Calf sex		Se		F-test	
	BBF	LF	SLF	Male	Female	Breed	Sex	Breed	Sex
Cow measurements									
Pelvic height (cm)	17.7	18.4	19.2	18.5	18.3	0.41	0.28	*	NS
Pelvic width (cm)	15.9	15.6	15.3	16.0	15.3	0.48	0.33	NS	NS
Pelvic area (cm^2)	273	279	285	286	270	9.9	6.8	NS	NS
Calf measurements (cm)									
Chest girth	79.9	77.3	78.5	78.7	78.4	1.19	0.87	NS	NS
Pelvic width (external)	22.3	22.2	22.3	22.0	22.5	1.27	0.92	NS	NS
Hind-quarter roundness	57.4	56.0	58.4	58.3	56.2	1.78	1.30	NS	NS
Head circumference	52.3	52.6	52.1	53.1	51.6	0.77	0.56	NS	NS

Table 5. Correlation between calf birth weights and measurements recorded on their dams.

	r	Significance
Pre-calving weight	0.17	NS
Post-calving weight	0.00	NS
Withers height	0.04	NS
Pelvic height	0.06	NS
Chest width	0.15	NS
Chest depth	0.01	NS
Chest girth	-0.13	NS
Pelvic width	0.20	NS
Length of back	0.01	NS
Cannon bone length	0.01	NS
Hind-quarter roundness	0.08	NS
[1]Pelvic height	0.11	NS
[1]Pelvic width	0.43	*
[1]Pelvic area	0.37	*

[1] **Internal Measurements**

Calf chest girth, hind-quarter roundness and calf head circumference were all positively correlated with calf birth weight (Table 6). The correlation between calf birth weight and pelvic width was not significant.

Table 6. Correlation between calf birth weights and skeletal measurements.

	r	Significance
Calf chest girth	0.74	***
Calf pelvic width	0.28	NS
Calf hind-quarter roundness	0.68	***
Calf head circumference	0.48	**

There was a significant positive relationship between calving difficulty score and calf birth weight (Table 7). Calving difficulty score was positively correlated with calf hind-quarter roundness but there was no significant effect of the other three calf skeletal measurements (chest girth, pelvic width or head circumference) recorded or any of the four calf skeletal measurements when expressed relative to the dams pelvic area.

Table 7. Correlations between the incidence of calving difficulties and calf birth weight and skeletal measurements

	r	Significance
Birth weight	0.51	***
Calf chest girth	0.31	P=0.06
Calf chest girth/cow pelvic area	-0.06	NS
Calf pelvic width	-0.03	NS
Calf pelvic width/cow pelvic area	0.12	NS
Calf hind-quarter roundness	0.36	*
Calf hind-quarter roudness/ cow pelvic area	0.23	NS
Calf head circumference	0.16	NS
Calf head circumference/cow pelvic area	-0.09	NS

There was a negative correlation between calving difficulty score and cow liveweight (Table 8). A highly significant positive correlation was obtained between calving difficulty score and calf birth weight expressed as a proportion of cow liveweight. Correlations between calving difficulty score and internal pelvic measurements were not significant. All correlations between calving difficulty score and external skeletal measurements were negative but only those with withers height and pelvic height were significant.

Table 8. Correlation between the incidence of calving difficulties and measurements recorded on the dam.

	r	Significance
Gestation length	-0.01	NS
Pre-calving weight	-0.28	P=0.09
Post-calving weight	-0.40	*
Birth weight/cow pre-calving weight	0.62	***
[1]Pelvic height measurement	-0.16	NS
[1]Pelvic width measurement	0.24	NS
[1]Cow pelvic area	0.11	NS
Withers height	-0.48	**
Pelvic height	-0.46	**
Chest width	-0.13	NS
Chest depth	-0.21	NS
Chest girth	-0.19	NS
Pelvic width	-0.22	NS
Length of back	-0.14	NS
Cannon bone length	-0.16	NS
Hind-quarter roundness	-0.21	NS

[1]Internal Measurements

DISCUSSION

The SLF heifers from the suckler herd were heavier and generally had greater external skeletal measurements and greater internal pelvic height than either the BBF or LF replacements from the dairy herd. Despite the longer gestation length for the SLF than for the other two breed crosses they had significantly lower calving difficulty scores than the BBF with the LF intermediate. The BBF had a lower pelvic height than the SLF and the results obtained by Murray et al. (1999) shows that "the larger the pelvic area, particularly pelvic height, the better the outcome when calving cows from both welfare and perinatal mortality perspectives".

Simple correlations showed that calving difficulty score increased with increasing calf birth weight and particularly as birth weight expressed as a proportion of cow weight increased, greater calf hind-quarter roundness and increased calf chest girth. All correlations between calving difficulty score and cow external skeletal measurements were negative with the animal height measurements having highly significant effects.

The liveweights of the BBF and the LF were similar and the only significant difference between the two breed types was the greater chest width of the BBF. While no other differences between those two breed types were significant, the BBF cows had numerically lower withers and pelvic height, smaller internal pelvic heights and pelvic areas, and their calves were heavier at birth with birth weights which were a higher proportion of cow weight, had greater chest girths and hind-quarter roundness all of which are associated with greater calving difficulty scores (also numerically higher). The greater chest girth of the BBF progeny compared to the LF is of relevance because of its close association with calf birth weights and calving difficulties as indicated by the present correlation coefficients.

CONCLUSIONS

Although the animal numbers were small the results from the present study show that the use of Belgian Blue crosses as suckler dams is likely to result in a higher incidence of difficult calvings than that obtained with other breed types. The calving difficulty scores of the BBF were significantly greater than the heavier SLF. The only significant difference between the BBF and LF was the greater chest width of the former heifers. However, the traits shown to be associated with a lower incidence of difficult calvings favoured the LF over the BBF. Such cow traits included greater withers and pelvic heights, greater internal pelvic height and pelvic area while desirable calf traits in this respect were lower birth weights, lower calf birth weight relative to cow weight, lower chest girth and reduced hind-quarter roundness. However, further information is required on the incidence of calving problems in both (1) Belgian Blue x Friesians and (2) the progeny of Belgian Blue x Friesians from a continental bull breed, e.g. Limousin x (Belgian Blue x Friesian) compared with (3) conventional crosses (e.g. Limousin x Freisian) when crossed with a standard continental breed of sire or a Belgian Blue sire. The availability of such data would allow informed recommendations on the possible role of Belgian Blue crosses as suckler herd replacements.

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