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Steer production from progeny of Holstein-Friesian cows and Belgian Blue or Charolais bulls

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Introduction

Belgian Blue bulls are preferred to Charolais for cross breeding on dairy cows in Ireland. There is a paucity of data on steer beef production from these breed types. The objective of this study was to compare Belgian Blue x Holstein-Friesian (BB) and Charolais x Holstein-Friesian (CH) steers for growth, feed intake and carcass traits. A total of 84 (48 BB and 36 CH) male calves were reared together to slaughter. BB were the progeny by artificial insemination (AI) of 3 known bulls (36) and of unidentified bulls (12). CH were the progeny of one known AI bull (12) and of unidentified bulls (24). Mean birth dates, mean arrival dates at Grange, and mean arrival weights for BB and CH were February 27 and February 16, March 23 and March 11, and 62 and 67 kg, respectively.

Materials and Methods

The calves were conventionally reared indoors and turned out to pasture on May 31. They grazed ahead of yearling steers in a leader/follower rotational grazing system. No concentrates were fed after turnout but from castration on September 20 to housing on November 29 the animals were offered 1 kg concentrates per head daily. During the first winter the animals were fed grass silage *ad libitum* plus 1 kg concentrates per head daily until turnout again on March 29. During the second grazing season they followed calves in leader/follower rotational grazing system. The animals were housed on October 9 and finishing on silage *ad libitum* plus 5 kg concentrates per head daily commenced on November 7. All animals were slaughtered together on March 20 following final weighing on March 13.

The analysis of the silage used in the first winter was: 210 g/kg dry matter (DM), 143 g/kg DM of crude protein (CP), 731 g/kg DM *in vitro* digestibility (DMD) and pH 3.7. The corresponding values for the second winter were 198 g/kg DM, 128 g/kg CP, 689 g/kg DMD, and pH 3.9. The concentrate composition (kg/t) used throughout was rolled barley 870, soya bean meal 67.5, molasses 47.5 and mineral/vitamin premix 15.

In the first winter the animals were accommodated in 6 pens of 8 (BB) and 6 pens of 6 (CH) in a slatted floor shed giving 6 observations per breed type for the measurement of feed intake. Pen size was adjusted to ensure the same space allowance per animal. Prior to turnout at the start of the second grazing season individual silage intakes were measured for two weeks on 26 BB and 22 CH. These same animals were housed again in May, July and September for the measurement of grass intake. Fresh grass was harvested daily and treated with formic acid as for silage conservation. A weighed allowance was offered daily for 14 days to each animal in a tie-up stall. Refusals were weighed back and discarded daily. After slaughter, cold carcass weights, carcass grades and carcass measurements were recorded. The right carcass side was divided into a pistola hind quarter and remaining fore quarter. The 6 to 10th rib joint was removed and dissected into its component tissues.

Results

Silage intake in the first winter and grass intake in the second grazing season did not differ significantly between the breed types either absolutely or per kg mean live weight (Table 1). The Charolais crosses were 12 days older and 5 kg heavier at arrival (Table 2). The weight difference increased to 11 kg at first turnout and to 24 kg at first housing due to a significantly higher growth rate by CH from first turnout to first housing. Thereafter, while growth differences were not significant, values tended to be higher for BB. However, CH were still 26 kg heavier ($P<0.05$) at the start of finishing and were 19 kg heavier at slaughter. There were no significant differences between the breed types in slaughter weight or carcass weight per day of age.

Slaughter traits and carcass measurements are shown in Table 3. There was no significant difference between the breed types in kill-out proportion, but because CH were 19 kg heavier at slaughter, their carcass weight was 10 kg heavier (both differences not significant). Conformation score was significantly better for CH but fat score was significantly lower for BB. Fat depth reflected fat score in that it was lower for BB (difference not significant). *M.longissimus* area scaled for carcass weight was similar for the two breed types. None of the carcass measurements scaled for carcass weight differed significantly between the breed types but all the values were numerically lower for CH indicating a trend towards greater carcass compactness in line with their superior carcass conformation score.

There were no significant differences between the breed types in the proportion of side weight in the pistola or in the composition of the ribs joint although there was a trend towards lower fat proportions in the BB in line with their lower fat score (Table 4).

Conclusions

It is concluded that lifetime daily live and carcass growth rates were similar for the two breed types. Carcass conformation was better, and indicators of carcass compactness tended to be better, for CH but carcass fat score was lower and fat depth tended to be lower for BB. There were no difference between the breed types in weight distribution between the fore and hind quarters or in ribs joint composition. Accordingly, there should be no reduction in beef productivity from replacing Charolais sires in dairy herds with Belgian Blue sires, which would shorten gestation length.

Table 1: Dry matter intakes (kg/day) of Belgian Blue x Holstein-Friesian (BB) and Charolais x Holstein-Friesian (CH) steers

	BB	CH	s.e.[1]
Silage in first winter[2]	3.68	3.57	0.289
Silage pre turnout[3]	5.03	4.80	0.109
Grass in May[4]	7.57	7.38	0.126
Grass in July[4]	6.27	6.26	0.122
Grass in September[4]	9.04	8.69	0.182
Mean grass intake	7.63	7.44	0.104
Mean grass intake[5]	18.5	17.4	0.372

[1]For CH, n =26; [2]Measured on 6 pens per breed type for 17 weeks, [3]Silage intake for 22 BB and 26 CH animals for two weeks before turnout. [4]Measured indoors on 22 BB and 26 CH animals; [5]g/kg live weight. There was no significant difference between BB and CH.

Table 3: Slaughter traits and carcass measurements for Belgian Blue x Holstein-Friesian (BB) and Charolais x Holstein-Friesian (CH) steers

	BB	CH	s.e.[1]	Sig.
Carcass weight (kg)	344	354	6.2	
Kill-out (g/kg)	539	538	2.3	
Conformation (scale 1-5)	2.38	2.66	0.09	*
Fat score (scale 1-5)	3.08	3.48	0.14	*
Fat depth (mm)	10.6	11.5	0.83	
M. longissimus area (cm^2/kg)[2]	0.258	0.252	0.0053	
Carcass measurements (cm/kg)[2]				
Carcass length	0.404	0.396	0.0066	
Carcass width	0.148	0.143	0.0025	
Leg length	0.216	0.212	0.0035	
Leg width	0.134	0.131	0.0020	
Leg thickness	0.083	0.083	0.0012	
Round circumference	0.357	0.349	0.0050	

[1]For CH, n = 36; [2]Of carcass.

Table 4: Pistola proportion and ribs joint composition of Belgian Blue x Holstein-Friesian (BB) and Charolais x Holstein-Friesian (CH) steers

	BB	CH	s.e.[2]
Pistola (g/kg side)	466	465	2.8
Ribs composition (g/kg)			
Subcutaneous fat	51	54	3.2
Intermuscular fat	142	148	6.1
Longisimus thoracis	216	215	4.4
Other muscle	404	399	5.5
Total fat	193	203	8.4
Total muscle	620	613	7.2
Total bone	187	184	3.5

For CH, n = 36; There was no significant difference between BB and CH.

Table 2: Lifetime live weights and live weight gains of Belgian Blue x Holstein-Friesian (BB) and Charolais x Holstein-Friesian (CH) steers

Live weights (kg) at:		BB	CH	s.e.	Sig
Arrival[2]		62	67	1.6	*
First turnout		111	125	3.5	**
First housing		253	277	6.3	**
Second turnout		346	364	9.4	
Start of finishing		516	542	7.7	*
Slaughter[3]		637	656	10.3	
Live weight gains (g/day) for:	**No. days**				
First turnout to first housing	182	778	838	21.2	*
First housing to second turnout	120	771	718	56.5	
Second turnout to second housing	224	761	797	40.3	
Finishing period[4]	126	936	871	52.2	
First to second turnout	302	775	790	26.8	
Second turnout to slaughter[4]	350	824	824	23.0	
First turnout to slaughter	652	802	808	14.2	
Arrival to slaughter[5]	-	792	797	14.2	
No. of Days					
Arrival to slaughter[5]	-	727	739	2.7	***
Birth to slaughter[5]	-	751	763	2.6	**
Per day of age (g)					
Slaughter weight	-	849	860	13.6	
Carcass weight	-	458	464	8.2	

[1]For CH, n = 36; [2]March 23 and March 11 for BB and CH, respectively. [3]The animals were slaughtered on March 20 but final weighing was on March 13, [4]To March 13, [5]March 20.