CAN NUTRITIONAL LEVEL AND PARENTAL EPD FOR RIB EYE AREA INFLUENCE ANIMAL PERFORMANCE AND CARCASS YIELD IN STEERS?

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Abstract – The objective of this trial was to measure the effect of two Winter Stoker Growth Rates (WSGR) and the utilization of two groups of sires with different values of Expected Progeny Differences (EPD) for Rib Eye Area (REA) on carcass yield and meat quality of Uruguayan Hereford steers. The evaluated WSGR were ´low´ and ´high´ and the REA EPDs were ´high´ and ´average´. Two generations of steers (201 animals) were grouped into two blocks according to weaning weight and were sorted out into a 2x2 factorial design, generating 4 treatments. After winter treatments, all animals grazed pastures with an herbage allowance of 5% of live weight (LW) per day. When animals reached 350 kg of LW, they started the finishing stage under lot feeding. Slaughtering was reached on average at 515 kg LW. High WSGR increases Hot Carcass Weight (HCW) and cut yield from the hindquarter (pistola cut) EPD. Sires with high REA EPD generated animals with similar HCW to those with average REA EPD but they had a higher proportion of cuts in the pistola cut. The animals treated with high REA EPD x high WSGR showed higher proportion of cuts than the other groups.

I. INTRODUCTION

Under Uruguayan pastoral conditions, the critical nutritional moments for beef stockers are the first and second winters of life since climatic conditions and rangeland forage production and quality do not permit adequate animal growth. Severe feeding restrictions at these periods may affect the productive performance of the animals during their whole life. It has been demonstrated that a more efficient calf stocker determines a reduction in the slaughtering age, increasing the system efficiency (Brito *et al.*, 2005).

Stocker cattle producers are primarily concerned with achieving optimum performance and profitability during their ownership phase but should also consider the effects of their production practices on subsequent finishing phase and carcass performance of the cattle that they manage (Reuter and Beck, 2013).

Sire selection criteria has a direct relation with the quality of the outcome product. Male sires with superior genetic merit for carcass traits will transmit part of that superiority to their progeny obtaining steers with better performance compared to steers born to bulls with less genetic merit. The Expected Progeny Differences (EPD) summarizes all available information into a prediction of genetic merit for an individual that can be used to make selection decisions (Thirft and Thrift, 2006).

The objective of the present work was to quantify the effect of different Winter Stoker Growth Rate (WSGR) and the utilization of male sires with different EPD for Rib Eye Area (REA) on carcass yield.

II. MATERIALS AND METHODS

The information belongs to an experiment carried out between 2011 and 2014 at the Beef Unit of the Experimental Station "Alberto Boerger" of INIA La Estanzuela at 34º20'45 South latitude and 57º42'40 West longitude, Uruguay.

For the experiment, 201 Hereford calves born to 17 bulls selected by their EPD for REA were used; 8 sires for high and 9 sires for average values of REA EPD obtained from the PANAM genetic evaluation of the Hereford breed. Bulls for high and average EPD values were in the percentile 10 and 50 respectively. One bull from each group connected between years.

The experimental design was a factorial 2 x 2 with two levels for WSGR (low and high, 0.182 and 0.583 kg of daily LW gain, respectively) and two different groups of EPDs for REA (high REA EPD and average REA EPD). The average

weight of the calves at weaning was 173 kg. Within each sire group and before sorting them into the nutritional treatments, the calves were re grouped in two blocks according to the weaning weight, totalizing eight groups each year (two years on total). These groups were kept separated from stocker until slaughtering.

During stocker, the calves were located in lot feeding pens and with the same area per animal of 15 m^2 and 70 cm of front through per head. The diet during stocker in the pens was made by 41% moha hay (*Setaria italica*), 21% corn grain, and 38% of sunflower meal. The animals were also provided with 85 g calcium carbonate and 10 g common salt per animal/day. The diet was the same for all animals and was calculated to cover protein requirements, having a concentration of 14.6% of Crude Protein (CP) and 2.33 Mcal of metabolize energy (ME) per Kg of dry mater (DM). The different daily growth rates were achieved by limiting the energy intake modifying the amount of feed given to the calves. The amount of the diet was adjusted every 14 days according to the average weight of the group and the target growth rate of the treatment. The animals were offered fresh water and minerals *ad libitum*. Before consuming the final diet, the calves were introduced to the diet for 15 days. In this period, the quantity of the diet was adjusted according to the average weight of the calves.

The lot feeding lasted 106 days. Thereafter, the animals grazed lucerne, white clover and fescue pastures in strip grazing with two or three days of occupation and herbage allowance of 5% of the steers live weight.

When any group reached an average live weight of 350 kg they were finished in a lot feeding. The diet was made by 80% of a commercial ration and 20% of moha hay with an average of 12.2% CP and 2.85 Mcal of ME per Kg of DM.

The animals were slaughtered at 515 Kg of average LW. Hot and chilled carcass weights were recorded. Carcasses were ribbed between 10-11th ribs. The left hindquarter (pistola cut) was weighed. The dressing percentage was estimated as the relation between HCW and LW at slaughtering (LWS). Also the relation between the pistola cut and chilled carcass weight was calculated. During the deboning of the left pistola cut, the seven most relevant cuts (tenderloin, striploin, sirloin, inside, outside, knuckle, and rump tale) were weighted and recorded, using UK standards. The weight of the fat, bone and trimmings were also measured. Based on this, the proportion of cutability, fat, bone and trimmings of the pistola cut, was estimated.

The different variables were analyzed by mixed models considering the block effect, the year, the WSGR (high and low), the REA EPD (high and average), the interaction between both, and the random effect of sire. For the analysis of weights of the pistola cut and its commercial cuts, the HCW was used as a co variable.

III. RESULTS AND DISCUSSION

The descriptive information of the experiment is presented in Table 1 and the results of carcass composition are presented in Table 2.

Table 1. Descriptive statistics for some traits measured in the experiment

	Treatments *			
	High REA High WSGR	High REA Low WSGR	Avg. REA High WSGR	Avg. REA Low WSGR
Number of animals	46	46	55	54
Winter Stocker I				
Fasted LW, kg	238^{a}	196^{b}	238^{a}	190^{b}
Avg. Daily gain, g/d	580^{a}	203^{b}	587^{a}	161^{b}
Grazing Stocker II				
Fasted LW, kg	337	332	338	338
Avg. Daily gain, g/d	569^{b}	617^{a}	513^{c}	660^{a}
Days on grazing	181^{a}	230^{c}	201^{b}	240^{c}
Finishing				
Fasted LW, kg	513	510	519	511
Avg. Daily gain, g/d	1191	1240	1213	1220
Finish period, days	148	147	151	147

* Avg.= average; REA=Rib eye area EPD; WSGR= Winter stocker growth rate. Values followed by different letters between rows are significantly different (P<0.05).

The interaction between WSGR and REA EPD was significant only for rump and loin weights, relation of rump and loin/pistola cut and fat percentage. For the rest of variable measured, the interaction was not significant, so the factors can be analyzed independently.

Table 2. Carcass composition for steers born to sires with different Rib Eye Area EPD (REA EPD) and different Winter Stocker Growth Rate (WSGR)

	REA EPD				WSGR			
	High		Average		High		Low	
Slaugther live Weight (SLW, kg)	486.8 ± 6.9		490.7 ± 6.4		490.9 ± 5.2		486.6 ± 5.3	
Hot Carcass Weight (HCW, kg)	264.6 ± 4.6		266.2 ± 4.3		268.3 ± 3.5	a	262.5 ± 3.5	b
HCW (adjusted by Fasted LW, kg)	267.1 ± 1.6		266.5 ± 1.5		268.5 ± 1.2	a	265.2 ± 1.2	b
Dressing out (HCW/SLW,%)	54.4 ± 0.3		54.2 ± 0.3		54.7 ± 0.2	a	54.0 ± 0.2	b
Dentition	1.7 ± 0.1		1.7 ± 0.1		1.6 ± 0.1	a	1.9 ± 0.1	b
Pistola cut (adjusted by HCW, kg)	54.8 ± 0.2		54.8 ± 0.2		55.0 ± 0.2		54.5 ± 0.2	
Pistola cut/Left side of chilled carcass weight	42.2 ± 0.2		41.8 ± 0.2		42.1 ± 0.2		41.9 ± 0.1	

Note: The interaction between REA and WSGR was not significant (P>0.05). With each factor, lines followed by different letters are significantly different (P<0.05).

Calves managed under high WSGR achieved higher HCW and cut yields. Similar results were obtained by Hersom *et al.* (2004) and Neel *et al.* (2007) who demonstrated that high growth rates during winter resulted in higher HCW. The animals with low WSGR reached slaughter at older age, where they had more definite teeth than at the high WSGR.

The results of the composition of the pistola cut are presented in Figure 1. For this variable, the interactions were significant only for fat percentage. Steers with High REA EPD and High WSGR showed low percentage of fat than the other combinations.

High WSGR increased the cuts proportion more than the low one (68.4±0.2% vs. 67.1±0.2%) and reduced the bone (21.8±0.2% vs. 22.5±0.2%) and trimmings proportion (5.0±0.1% vs. 5.4±0.1%) in the pistola cut. Steers born to bulls with higher REA EPD presented higher value cut proportions than the average one (68.3±0.2% vs. 67.2±0.2%) as well as less bone proportion (21.8±0.2% vs. 22.4±0.2%)

The conformation of the pistola cut is presented in Table 3. Steers born to high REA EPD presented higher total weight of cuts from the hindquarter and a higher weight of the rump and loin cuts, explained by higher sirloin weights, in comparison with average REA EPD.

The same conclusion was obtained from animals with high WSGR for total cut weights rump and loin and sirloin cuts, compared with low WSGR. For this effect (high WSGR), the striploin weights also were higher than for low WSGR.

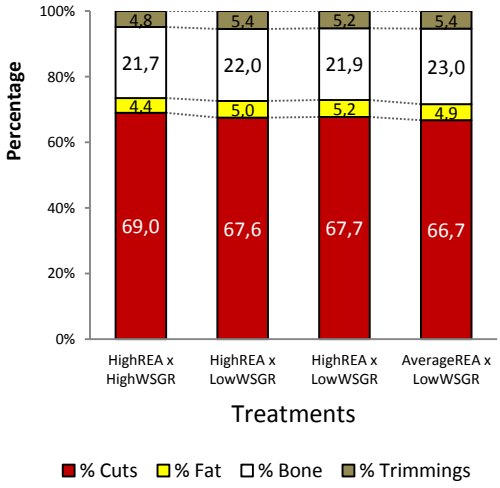

Fig. 1. Cutability, fat, bone and trimmings percentage of pistola cut for the treatments according to the UK protocol.

For the rump and loin weights and for the relation between rump and loin cuts/pistola cut the interaction between REA EPD and WSGR was significant. Animals with High REA EPD and High WSGR obtained higher weights and higher proportions of rump and loin in the pistola cut (11.866±0.142 kg, 21.6±0.2%) than the other treatments (11.178±0.121 kg, 20.4±0.2 for High REA EPD and Low WSRG, 11.294±0.112 kg, 20.5±0.2% for Average REA EPD and High WSRG and 11.176±0.115 kg, 20.4±0.2 %for Average REA EPD and Low WSRG).

Table 3. Pistola cut weight composition for steers born to Bulls with different Rib Eye Area EPD (REA EPD) and different Winter Stocker Growth Rate (WSGR).

Cuts (Kg)[1]	REA EPD		WSGR	
	High	Average	High	Low
Total cuts weight [2]	37.450 ± 0.189 a	36.846 ± 0.165 b	37.556 ± 0.170 a	36.741 ± 0.159 b
Rump & Loin*	11.522 ± 0.095 a	11.235 ± 0.082 b	11.580 ± 0.089 a	11.177 ± 0.083 b
Rump & Loin/Pistola cut*	21.0 ± 0.2 a	20.5 ± 0.2 b	21.0 ± 0.2 a	20.4 ± 0.1 b
Tenderloin	2.112 ± 0.021	2.073 ± 0.018	2.109 ± 0.017	2.076 ± 0.016
Striploin	4.837 ± 0.074	4.648 ± 0.067	4.887 ± 0.056 a	4.599 ± 0.055 b
Sirloin	5.117 ± 0.063 a	4.874 ± 0.057 b	5.085 ± 0.050 a	4.879 ± 0.048 b
Inside Round	7.925 ± 0.087	7.879 ± 0.078	7.995 ± 0.069 a	7.809 ± 0.066 b
Outside Round	6.933 ± 0.058	6.977 ± 0.050	6.941 ± 0.055	6.969 ± 0.051
Knuckle	5.105 ± 0.044	5.184 ± 0.038	5.163 ± 0.040	5.126 ± 0.037
Tail rump	1.272 ± 0.020 a	1.213 ± 0.018 b	1.258 ± 0.017	1.227 ± 0.016

The interaction between REA and WSGR was not significant (P>0.05). Within each factor, lines followed by different letters are significantly different (P<0.05).
[1] Adjusted by HCW.
[2] The cuts weight includes the sum of tenderloin, striploin, sirloin, inside and outside round, knuckle, tail rump, hell muscle and shank.
* Interaction between WSGR and REA EPD was significant (P<0.05).

IV. CONCLUSION

The results obtained during this two years´ evaluation, indicates that the utilization of sires with high REA EPD and high growth rate during the first winter of life, positively affected carcass yield.

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