PERFORMANCE AND CARCASS QUALITY OF STEERS WITH DIFERENT NUTRITIONAL LEVELS AND PARENTAL EPD FOR RIB EYE AREA

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Abstract – Experiment objective was to measure the effect of 2 Winter Stoker Growth Rates (WSGR; low and high) and the utilization of two groups of sires with different values of Expected Progeny Differences (EPD) for Rib Eye Area (REA; high and average) on the yield and quality of meat of Hereford steers. 86 steers grouped in two blocks according to weaning weight were used and sorted in a factorial design of 2x2 generating 4 treatments. After differential stoker, all animals grazed pastures with an herbage allowance of 5% of live weight per day. When animals reached 350kg of live weight, they started the finishing stage under lot feeding. Slaughtering was reached in average at 515 kg. High WSGR or progeny of sires of high REA increased carcass meat production. High WSGR increased Hot Carcass Weight (HCW) and yield. Sires with high REA generated animals with similar HCW to those with average REA but they had better carcass conformation since due to relation of the hindquarter to the forequarter and higher proportion of cuts. The animals of treatment high REA*high WSGR had better cutability than those of the other treatments.

I. INTRODUCTION

Under Uruguayan pastoral conditions, the critical moments for beef stockers are the first and second winter of life since climatic conditions and quantity and quality of native pastures do not permit adequate growth rates. Severe restrictions at these moments 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 [1].

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 they manage[2].

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[3].

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 and quality.

II. MATERIALS AND METHODS

The information belongs to an experiment carried out between 2012 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, 86 Hereford calves born to 8 bulls selected by their EPD for REA were used; 4 sires for high and 4 sires for average values of REA EPD obtained from the PANAM genetic evaluation of the Hereford breed. Bulls for high and average EPD values are in the percentile 10 and 50 respectively.

The experimental design was a factorial 2 x 2 with two WSGR (low: 0.211 and high: 0.563 kg of daily live weight gain) and two different groups of EPDs for REA (high REA EPD and average REA EPD). The average weight of the calves at weaning was 175 kg. Within each sire group and before sorting them into the nutritional treatments, the calves were regrouped in two blocks according to the weaning weight, totalizing eight groups. 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 trough per head. The diet during stocker in the pens was made by 46% moha hay (*Setaria italica*), 19% corn grain, and 35% of sunflower meal. The animals were also provided with 70 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 14.5% of Crude Protein (CP) and 2.23 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 113 days, between the 9th of July and the 30th of October 2012. 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 weight of 350 kg they were finished in a lot feeding. The diet was made by 80% of a commercial ratio and 20% of moha hay with an average of 10.4% CP and 2.71 Mcal of ME per Kg of DM.

The animals were slaughtered according to the UK protocol when they reached 515 Kg of live weight, hot and chilled carcass weights were recorded. Length of the carcass, perimeter of leg and weight of the pistol cut were measured on the left half of the carcass. The dressing percentage was estimated as the relation between the weight of the hot carcass and the slaughtering weight. The relation between the hind and forequarter of the left side of carcass was calculated as the relation between the pistola cut with chilled carcass weight, and relation between the HCW with CL was estimated. During deboning of the left pistola cut, the seven most relevant cuts: tenderloin, striploin, sirloin, inside round, outside round, knuckle, rump tail were weighted and recorded. 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 WSGR (high and low), the REA EPD (high and average), the interaction between both, and the random effect of sire. For the analysis of carcass length, perimeter of leg, weight of the pistola cut and cuts from the pistola cut the HCW 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	24	26	19	17
Winter Stocker I				
Final weight, kg	242	203	244	204
Avg. Daily gain, g/d	556	207	570	215
Grazing Stocker II				
Final weight, kg	357	357	361	350
Avg. Daily gain, g/d	575	542	507	512
Days on grazing	188	267	253	305
Finishing				
Avg. Daily gain, g/d	1171	1273	1207	1253
Finish period, days	150	136	151	141

* Avg.= average; REA=Rib eye area EPD; WSGR= Winter stocker growth rate.

The interaction between WSGR and REA EPD was not significant, so the factors can be analyzed independently.

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

	REA EPD		WSGR	
	High	Average	High	Low
Slaugther Weight	515.6 ± 9.9	518.3 ± 10.6	520.8 ± 8.4	513.1 ± 8.6
HCW	266.8 ± 2.5	261.9 ± 2.6	266.8 ± 1.9 a	262.0 ± 1.9 b
HCW < 220 kg (%)	0	7	0	6
220 kg ≥ HCW < 240 kg (%)	4	19	11	19
240 kg ≥ HCW < 260 kg (%)	29	11	37	38
260 kg ≥ HCW < 280 kg (%)	29	44	16	13
HCW ≥ 280 kg (%)	38	19	37	25
Dressing (%)	51.6 ± 5.0	50.6 ± 5.2	51.6 ± 3.9 a	50.6 ± 3.9 b
Dentition	2.2 ± 0.1	2.2 ± 0.1	2.0 ± 0.1 a	2.5 ± 0.1 b
Carcass length (CL, cm)	156.4 ± 1.1 a	151.0 ± 1.1 b	156.7 ± 0.9 a	150.7 ± 0.9 b
Perimeter of leg (cm)	109.4 ± 0.3 a	106.7 ± 0.4 b	108.7 ± 0.3 a	107.4 ± 0.4 b
HCW/CL	1.69 ± 0.01 a	1.75 ± 0.01 b	1.69 ± 0.01 a	1.76 ± 0.01 b
Pistola cut (kg)	55.0 ± 0.2 a	54.1 ± 0.3 b	54.9 ± 0.3	54.3 ± 0.3
Hind quarter/Left side of chilled carcass weight	42.7 ± 0.2 a	41.8 ± 0.3 b	42.6 ± 0.2	42.0 ± 0.2

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

Calf managed under high WSGR achieved higher HCW and meat yield. The animals with low WSGR reached slaughter at older age, they were observed to have more definite teeth than the high WSGR and a higher proportion of lighter HCW. Similar results were obtained by Hermson et al. (2004)[4] and Neel et al. (2007)[5] who demonstrated that high growth rates during winter resulted in higher HCW.

High WSGR determined carcass of higher length and higher leg perimeters and less HCW/CL relation, not observing HCW with less than 220 kg.

Steers born to bulls with higher REA presented higher carcass length, perimeter of leg, weight of pistola cut at equal HCW and best relation of hind quarter/left side of chilled carcass weight. This is in accordance with the results of Lamb et al. (1990)[6] who obtained high correlations between REA and HCW.

The results of the composition of the pistola cut are presented in Figure 1. For the composition of the pistola cut, the interactions were significant.

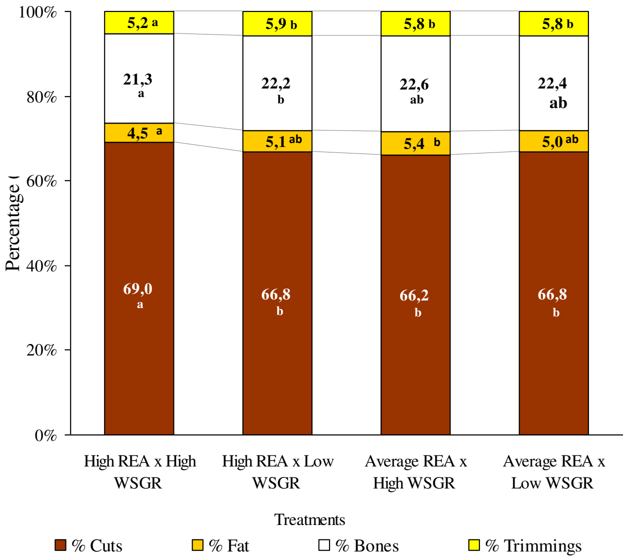

Fig. 1. Cutability, fat, bone and trimmings percentage of pistola cut for the treatments according to the UK protocol.

Animals with high REA and high WSGR had more percentage of cuts in the pistola cut, less trimming and less fat and bone in relation to the other treatments. Steers born to bulls with high REA and reared with low WSGR did not achieve the same performance as when they were with high growth rate during stoker. In the same way, the animals with average REA had less proportion of cuts when they were stocked compared to high WSGR.

Within the conformation of the pistola cut (Table 3) there was no interaction between the treatments, so response to REA EPD and WSGR are independent and additive. Steers born to high REA EPD presented higher total weight of cuts and higher weight of the rump and loin, mainly. The last is explained by higher weights of the striploin and the sirloin. Animals with high WSGR also had higher weight of the rump and loin explained by the same components.

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)	REA EPD		WSGR	
	High	Average	High	Low
Total cuts weight*	37.4 ± 0.3 a	36.3 ± 0.3 b	37.2 ± 0.3	36.6 ± 0.3
Rump & Loin	12.420 ± 0.082 a	11.299 ± 0.103 b	12.291 ± 0.090 a	11.429 ± 0.095 b
Tenderloin	2.123 ± 0.036	2.041 ± 0.039	2.102 ± 0.029	2.062 ± 0.030
Striploin	4.987 ± 0.054 a	4.489 ± 0.067 b	4.912 ± 0.059 a	4.564 ± 0.063 b
Striploin < 4.5kg (%)	8	35	37	88
Striploin ≥ 4.5kg (%)	92	65	63	12
Sirloin	5.307 ± 0.047 a	4.754 ± 0.590 b	5.272 ± 0.051 a	4.789 ± 0.055 b
Inside Round	7.873 ± 0.071	7.731 ± 0.089	7.828 ± 0.078	7.776 ± 0.840
Outside Round	6.845 ± 0.091	6.996 ± 0.114	6.758 ± 0.099 a	7.083 ± 0.107 b
Knuckle	4.962 ± 0.047	5.103 ± 0.058	5.016 ± 0.050	5.049 ± 0.054
Rump tail	1.325 ± 0.022	1.293 ± 0.027	1.314 ± 0.024	1.303 ± 0.026

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). * The cuts weight includes the sum of tenderloin, striploin, sirloin, inside and outside round, knuckle, rump tail, hell muscle and shank.

IV. CONCLUSION

The results obtained in the first year of evaluation indicates that the utilization of sires with higher REA EPD and stocking with better growth rate in the first winter of life, affect positively the yield and quality of the carcass.

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REFERENCES

1. Brito, G.; Del Campo, M.; Pittaluga, O. & Soares de Lima, J.M. 2005. Una mejor recría para una mayor eficiencia en la producción de carne. Revista INIA Nº 3 Pág. 8-11
2. Reuter, R.R. & Beck, P.A. 2013. Southern section interdisciplinary beef cattle symposium: Carryover effects of stocker cattle syspems on feedlot performance and carcass characteristics. JAS 91:508-515.
3. Thirft, F.A. & Thrift, T.A. 2006. Review: Expected versus realized progency differences for various beef cattle traits. The Professional Animal Scientist. 413-423.
4. Hersom, M.J.; Horn, G.W.; Krehbiel, C.R. & Phillips, W.A. 2004. Effect of live weight gain of steers during winter grazing: I. Feedlot performance, carcass characteristics, and body composition of beef steers. JAS 82:262-272.
5. Neel, J.P.; Fontenot, J.P.; Clapham, W.M.; Duckett, S.K.; Felton, E.E.; Scaglia, D.G. & Bryan, W.B. 2007. Effects of winter stocker growth rate and finishing system on: I. Animal performance and carcass characteristics. JAS 85:2012-2018.
6. Lamb, M.A.; Robison, O.W. & Tess, M. W. 1990. Genetic parameter for carcass traits in Hereford Bulls. JAS 68:64-69.