

DIFFERENT NUTRITIONAL STRATEGIES OF YEARLING CALVES AND SUBSEQUENT EFFECTS ON ANIMAL PERFORMANCE AND CARCASS TRAITS IN URUGUAY

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Abstract – The objective of this study was to evaluate the effects of supplementation frequency with rice bran concentrate on calves performance grazing on a cultivated pasture and their subsequent effect on carcass quality traits. Forty Hereford calves (184.0 kg live weight; LW) were randomly assigned to four treatments (T) as a result of the combination of a unique forage allowance (FA 2.5% LW) and three supplementation frequencies (S; 0.8 % LW, unique supplementation level) but distributed different during the week in the winter period, where: T1=FA 2.5% LW (control), T2=FA 2.5% LW plus S everyday (ED), T3=FA 2.5% LW plus S from Monday to Friday (MtF) and T4=FA 2.5% LW plus S every other day (EOD). At the beginning of the experiment, the animals did not show significant differences ($P>0.05$) in LW between T. At the end of the supplementation period lower LW ($P<0.05$) was observed in T1 compared to the rest of T. The same trend was observed with the ultrasound measurements done of ribeye area (REA) and back fat thickness (BFT) ($P<0.05$). The slaughter weight was not affected by T during rearing ($P>0.05$). Hot carcass weight (HCW), chilled carcass weight (CCW), pistol cut (PC) and its boneless high value cuts (Striploin, Tenderloin, Rump; RL) did not differ between feeding systems ($P>0.05$). Morphometric measurements were not affected by diets during rearing ($P>0.05$). The addition of supplement (0.8% LW) allowed an increase in LW gain during rearing, regardless of the frequency in which animals were fed. The different feeding systems implemented during the first winter period of the life of the calves did not affect the carcass quality traits considered when the animals were adequate feed from rearing to fattening.

KEYWORDS: nutritional strategies, calves, animal performance, carcass traits.

I. INTRODUCTION

In the last decades, the increasingly competitive conditions concerning to the increase of land price and leasing and to attractive commodity prices have led to livestock farmers to enhance productive and profit. The intensive use of improved pastures, animal supplementation, genetic improvement and efficient usage of scarce and costly labor resources are key factors to increase productivity and profitability in livestock farming today. All these management practices put into place had led to acceleration of the rearing process and as a result of this, a potential reduction in slaughter age and an overall improvement of the efficiency of the production system. National and international research have demonstrated that the use of improved pastures and supplementation in cattle have a positive influence on animal performance as well as on carcass quality traits (1) (2), but less information is available on the effect on rearing feeding regions on aftereffects during fattening and carcass and meat quality. The objective of this experiment was to evaluate supplementation frequency of calves grazing on a cultivated pasture during winter and its possible effects on animal performance and carcass quality traits at the time of slaughter.

II. MATERIALS AND METHODS

This experiment was carried out at the “Glencoe” Experimental Unit – INIA Tacuarembó, situated in the Basaltic region of Uruguay. Forty Hereford calves, with an average initial live weight (LW) of 184.0 ± 8.5 kg grazing on a cultivated pasture, were distributed randomly into four treatments (T) during winter using a unique forage

allowance (FA; 2.5% LW) and different supplementation frequencies (S) using rice bran (RB) concentrate with only one single level of S (0.8% LW), but distributed in different frequencies during the week, where: T1=FA 2.5 % LW, T2=FA 2.5 % LW + S Every Day (ED), T3=FA 2.5% LW + S Monday to Friday (MtF) and T4=FA 2% LW + S Every Other Day (EOD). Once winter was over and until the beginning of the summer, all of the animals had same feeding treatments where FA was 4% LW without supplementation. During summer, animals grazed on a summer annual crop (*Sorghum bicolor L. moench* and *Sorghum sudanense*) and they were supplemented with a protein supplement (sunflower). Finally, throughout the fattening period, the animals grazed on natural pasture, supplemented with RB at a rate of 1% LW. During the winter time animals were divided into four replicates. During the whole experiment animals had free access to fresh water and mineral blocks. The forage used was a four year old cultivated mixed pasture (*Trifolium repens* cv. INIA Zapicán, *Lotus corniculatus* cv. INIA Draco and *Festuca arundinacea* cv. Quantum). The measurements taken on animals were weekly LW gain and fasted LW gain every 42 days. For T2, T3 and T4, the feed intake was adjusted every 14 days, according to the average LW of the animals in each plot. The variables measured *in vivo* by ultrasound scanning were rib eye area (REA), back fat thickness (BFT) and marbling at the beginning of the trial and every 28 days. At the end of the fattening period the animals were slaughtered at a commercial packing plant. Hot carcass weight (HCW) and carcass grading (3) were recorded. After chilling (48 hours *post mortem*) carcass weight (CCW) and pistol cut (PC) were recorded, and samples taken between the 10-11th ribs. Boneless cuts from this primal cut (RL) were weighed. The statistical design was a random plot model with four replicates of the treatments described earlier. The animal data was analyzed as repeated measurements through the MIXED procedure of SAS and the results of carcass quality were analyzed by the GLM SAS procedure (4). LSM means and differences among treatments were estimated (P<0.05 or <0.01).

III. RESULTS AND DISCUSSION

The effects of different nutritional strategies during rearing on animal performance are presented in Table 1. At the beginning of the experiment, no significant differences were found in LW. At the end of winter supplementation and spring, animals from T1 had lower LW (P<0.01) and lower LW gain (P<0.05) than T2, T3 and T4, where T1<T2=T3=T4. These results probably reflected the different energy intake of the steers. The supplemented treatments had the same RB concentrate intake, regardless of the supplementation frequency. Measures taken *in vivo* (REA, BFT) showed the same response as final LW and LW gain (P<0.05). National research (2), reported the same findings with similar levels of forage allowance and supplementation.

The effects of feeding treatments on carcass traits are shown in Table 2. Feeding strategies used during rearing did not affect the variables measured on carcass (P>0.05). However, other local research studies, comparing contrasting diets during rearing (feedlot versus pasture) have concluded that this type of management have had an important effect on LW gain during the finishing period, also influencing HCW and fat level (5).

Table 1. Animal performance traits of steers under different feeding strategies.

Variable	T1	T2	T3	T4	P
Initial LW ^a (kg)	183.8	183.4	183.9	183.8	ns
LW ^b (kg)	198.5b	214.1a	220.6a	218.4a	**
LW ^c (kg)	265.2b	285.7a	287.1a	284.6a	**
FLW ^c (kg)	251.6b	276.2a	274.9a	271.8a	*
LW gain ^b (kg/a/d)	0.440b	0.673a	0.603a	0.660a	*
LW gain ^c (kg/a/d)	0.500b	0.646a	0.643a	0.613a	*
REA ^c (cm ²)	37.7b	40.6ab	43.0a	42.4a	*
BFT ^c (mm)	2.14	2.00	2.19	2.10	ns
Final LW ^d (kg)	529.9	537.6	530.6	534.7	ns

Note: a, b = means with different letters among columns are significantly different (*; P<0.05; **: P<0.01). ns = not significant. ^a July 2012. ^b September 2012. ^c December 2012. ^d November 2013

Table 2. Carcass traits of steers under different feeding strategies.

Variable	T1	T2	T3	T4	P
HCW (kg)	251.9	254.9	252.6	257.9	ns
CCW (kg)	240.6	243.3	241.6	246.6	ns
PC (kg)	58.6	59.1	58.7	61.0	ns
Rump & Loin (kg)					
Tender loin	1.7	1.7	1.6	1.7	ns
Strip loin	3.5	3.5	3.7	3.8	ns
Rump	2.0	2.0	2.2	2.1	ns
Morphometric measures (cm)					
Carcass length	141.2	144.6	142.0	141.5	ns
Leg perimeter	109.1	108.2	107.4	109.6	ns
Leg length	69.5	69.7	70.9	71.9	ns

Note: ns = not significant.

IV. CONCLUSION

The use of RB supplement on calves during the winter time grazing improved pastures improves animal performance and reduce the age at slaughter, resulting in better production efficiency in semi extensive livestock systems of the Basaltic region of Uruguayan. However, it is important to highlight that the use of the same level of supplementation (1% LW), but using different supplementation distribution

frequencies along the week did not affect LW gains or ultrasound variables. Therefore, infrequent supplementation strategies would allow a more efficient use of the available human resources and reducing production costs without affecting animal performance during rearing in those livestock systems. Furthermore, those carcass quality traits evaluated were not affected by the different feeding regimes applied during rearing when animals received an adequate feeding during fattening.

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