Beef heifers performance under continuous grazing on modified grassland in Argentina Flooding Pampa

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Introduction

The Salado river basin is the main beef cattle breeding region of Argentina. It is a flat flooding area with poor slopes (<3%). Their soils are Natracuoles, Natraqualfes and Argiacuoles. The grasslands are predominately continuously grazed and with a set stocking rate cow – calf system. Stocking rate and grazing pressure are two core variables that directly affect animal production. Reduced animal performance is believed to be due to poor grazing management. During 2010, 2011 and 2012 an experiment on the effect of stocking rate on animal growth and body condition with Angus heifers continuously grazing annual winter grasses, was carried out. Previous studies have demonstrated the practicability of producing replacement females with this management (Carrillo 2001; Eirin *et al*. 2011; Agnelli *et al*. 2011) that involves mesothermic grasslands modification into self sown winter grasses by using glyphosate and other herbicides (Oyhamburu *et al*. 2000, Rodriguez and Jacobo 2010).

The aim of this study was to establish the stocking rate that optimizes beef rearing heifer's performance for early mating.

Methods

The experiment was conducted at "El Amanecer" farm (UNLP), located in Vieytes, Argentina (57°07'W; 35°01'S). A modified mesophytes grassland was developed by the application of 5 l/ha of glyphosate and 1 l/ha of 2.4-D to promote germination and establishment of winter annual species mainly *Lolium multiflorum*, *Bromus catharticus* and *Gaudinia fragilis*. Continuous grazing was performed from early June to late October in 2010 and 2011, and from mid-May to late October in 2012. Frame score 3 rearing heifers for early mating were used. The initial body weight was 164.3 ± 0.22 kg in 2010, 169.5 ± 0.20 kg in 2011 and 186.0 ± 0.20 kg in 2012. Three year average of initial grassland height was 18.4 ± 1.7 cm and initial total herbage biomass was 1905.1 ± 124.1 kg/ha. Treatments expressed in cow equivalent (EV) (Cocimano *et al*. 1975) were: high stocking rate (HSR), where the grazing area was adjusted to an average load of 3 EV/ha (4.4 animals/ha) and low stocking rate (LSR) where we used an average load of 2 EV/ha (3 animals/ha). A randomized block design with three replications in space and 6 animals per experimental unit was designed. Every 14 days we measured the total herbage biomass (THB), the height of defoliated tillers (DT) and animal live weight (LW), and estimated the daily live weight gain (DWG) and body condition score (BCS). All results were analyzed by ANOVA and Tukey test.

Results and Discussion

Weather conditions during the three year experiment showed significant variations in autumn-winter rainfall, with possible impact on primary production and animal response. These oscillations are common in the region (Table 1).

The average THB was 70 and 94 % higher in 2010 and 2011 than in 2012, while DT showed similar behavior but with minor differences (Table 2). The initial THB was 1443.6 kg DM/ha in 2012, being lower (P<0.001) than 2010 and 2011 (2112.2 and 2148.9 kg DM/ha respectively). The LW was not influenced by initial body weight, which in 2012 was 20 kg higher than the average of previous years, and these animals ended with same LW of 2010 because of the prevailing environmental conditions (Table 1). The combination of a very dry autumn, and winter rainfall excess in 2012, added to a higher initial grazing pressure, resulted in a significant reduction in the herbage live biomass. Consequently, DWG in 2012 was 37 and 35 % of that observed in 2010 and 2011. The BCS did not differ in these years, but was lower in 2012 (Table 2). At the end of the experiment, stocking rate determined THB, the DT and live weight of heifers, but not BCS (Table 3). The percentage of heifers that reached the threshold weight for early mating (250 kg in October) for HSR was 61 % in 2010, 50 % in 2011 and 13 % in 2012 and 78 %, 83 %, and 33 % for LSR respectively. The results of 2010 and 2011 are consistent with those of 2007 (Agnelli *et al*. 2011), when the percentage of heifers in early mating was 61 and 83 % respectively for HSR and LSR. The three years average of total animal live weight production was 306 kg/ha for HSR and 281 kg/ha for LSR. Modified grassland stopped being by mid-October every year, allowing an intense manifestation of reproductive status and seed production.

Table 1. Rainfall (mm) during the experimental period.

Year	March - April	May - June	July	August	September - October	Total Period
2010	170	210	107	22	155	664
2011	66	185	72	15	81	519
2012	100	55	5	185	149	494

Table 2. Effects of stocking rate, year and season on studied variables.

Parameters	Treatments		Years			Seasons	
	HSR	LSR	2010	2011	2012	Autunn-Winter	Spring
THB (kgDM/ha) (*)	1317 ± 45 a	1827 ± 45 b	1717 ± 55 b	1998 ± 55 c	1004 ± 55 a	1686 ± 41 b	1400 ± 50 a
DT (cm) (*)	6.29 ± 0.23 a	8 .70 ± 0.23b	7.35 ± 0.40 b	9.43 ± 0.25 c	5.93 ± 0.24 a	8.37 ± 0.21 b	6.11 ± 0.40 a
LW (kg) (*)	215.6 ± 1.0 a	224.6 ± 1.0 b	215.9 ± 1.3 a	230.4 ± 1.3 b	215.5 ± 1.1 a	208 ± 0.9 a	238 ± 1.1 b
DWG (kg)(▲)	0.44 ± 0.03 a	0.55 ± 0.03 b	0.65 ± 0.04 b	0.68 ± 0.05 b	0.24 ± 0.04 a	0.64 ± 0.04 b	0.38 ± 0.03 a
BCS (▲)	3.52 ± 0.02 a	3.59 ± 0.02 b	3.81 ± 0.02 b	3.75 ± 0.02 b	3.22 ± 0.02 a	3.39 ± 0.02 a	3.82 ± 0.02 b

(*) Means with different letters differ at $P = 0.0001$ (▲) Means with different letters differ $P = 0.05$.

Table 3. Comparison of variables at the end of the experiment, three-year average.

Treatments	THB (kgDM) (*)	DT (cm) (*)	LW (kg) (*)	BCS (▲)
HSR	1313 ± 113 a	4.34 ± 0.30 a	244.8 ± 4.2 a	3.80 ± 0.05 a
LSR	1903 ± 113 b	6.19 ± 0.30 b	262.2 ± 4.4 b	3.91 ± 0.06 a

(*) Means with different letters differ at $P = 0.01$ (▲) Means with different letters differ at $P = 0.05$.

Conclusions

The promotion of winter species using herbicides produces a suitable resource for the rearing heifers. LSR allowed reaching the threshold weight for early mating in a high percentage of rearing animals. HSR allowed sustaining high stocking rate in winter, the possibilities of improving the efficient use of spring forage production and high production of meat. The productive planning was sensitive to high environmental variability expressed through the year effect.

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