

EFFECT OF SORGHUM GRAIN SILAGE AND ROUGHAGE MANAGEMENT ON ANIMAL PERFORMANCE AND MEAT AND CARCASS TRAITS IN STEERS FINISHED IN FEEDLOT

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Abstract – The objectives of this study was to evaluate three types of grain silage sorghum with different levels of tannins and roughage management on animal performance, meat and carcass traits of steers finished in feedlot. The experiment was conducted at the INIA, Colonia, Uruguay. A total of 48 Angus x Hereford, with 20-22 months of age and with initial weight of 355 ± 58 kg were used. The animals were distributed in blocks by initial weight in a 3 x 2 factorial arrangement. For weigh, weight gain and meat and carcass traits the model included the effect of sorghum grain, roughage management, the interaction between sorghum grain and roughage management, the block and the effect of period. The means were compared with the Tukey-Kramer test ($p < 0.05$). The daily weight gain was higher when roughage was supplied separated from the concentrated in the high tannins treatments. The effect of interaction between sorghum grain and roughage management was not significant for carcass and meat traits. The roughage management may influence weight gain, depending on the type of sorghum used. Except for marbling content, the type of grain silage sorghum or roughage management did not affect meat and carcass traits.

Key Words – Crossbred steers, Ribeye area, Weight gain

• INTRODUCTION

Sorghum (*Sorghum bicolor*) is a grain commonly used in Uruguay in beef cattle production systems. The sorghum has economic advantages compared to other crops: it is easier to cultivate with low investment, has a large, cycle that allow to be used in different rotations, and also, they have condensed tannins which helps in bird control. However little information about animal performance has been reported using sorghum grain. On the other side, roughage management in the trough can affect feed intake, animal performance and carcass and meat traits in cattle [1].

The objectives of this study was to evaluate three types of sorghum with different levels of tannins under grain silage and roughage management (TRM or separated) on animal performance, meat and carcass traits of steers finished in feedlot.

• MATERIALS AND METHODS

The experiment was conducted at the National Institute of Agricultural Research (Instituto Nacional de Investigación Agropecuaria INIA), experimental station "La Estanzuela", Colonia, Uruguay. The experiment was carried out in winter with a total length of 83 days. Forty eight crossbred steers (Angus x Hereford), with 20-22 months of age and an initial weight of 355 ± 58 kg were used. Three silage of sorghum grain were evaluated: IPB Flash1 variety with high tannin-red pericarp (8.55%) (HT: high tannin); Solarium variety with low tannin-red pericarp

(0.15%) (LW: low tannin) and Jowar Food variety without tannin and white pericarp (WH: without tannin and white pericarp). The roughage was supplied in two ways: roughage and concentrated separated in different troughs (SP) or together in a total mixed ration (RTM). A total of 6 treatments were evaluated: HT-SP - sorghum high tannin and roughage separated from concentrated; HT-RTM - sorghum high tannin and roughage mixed with concentrated; LT-SP - sorghum low tannin and roughage separated from concentrated; HT-RTM - sorghum low tannin and roughage mixed with concentrated; WH-SP - sorghum without tannin and white pericarp and roughage separated from concentrated; HT-RTM - sorghum low tannin and roughage mixed with concentrated. The diets were composed by 80% concentrated (70% grain sorghum silage and 10% sunflower meal) and 20% roughage (*Setaria Italica* hay). The meal was offered in two moments (morning and afternoon). The animals were weighed each 14 days (7 times) during the experimental period. The animals were slaughtered according to procedures of a humane slaughter. After slaughter, measurements were made to determine the following carcass and meat traits: loin ribeye area (REA), back fat thickness (BFT), marbling content in percentage (MB), pH and meat color CIE Lab L *, (a *) (b *). The steaks of 1.27 cm removed from the 12th 13th (*Longissimus muscle*) ribs were matured for 14 days to determine the shear force (SF). The animals were distributed in blocks by initial weight in a 3 x 2 factorial arrangement. The weights and weight gain were analyzed in repeated measures analyses. For weigh, weight gain and meat and carcass traits the model included the effect of sorghum grain (sorghum high tannin, sorghum low tannin and white pericarp sorghum), roughage management (mixed or separated from concentrated), and the interaction between sorghum grain and roughage management, the block and the effect of period. The means were compared with the Tukey-Kramer test (p< 0.05).

- RESULTS AND DISCUSSION

There was a significant effect of diets on mean weight and daily mean weight gain (P<0.05) (Tables 1). The daily weight gain was higher when roughage was supplied separated from the concentrated in the high tannins treatments. The average daily gains obtained were equal or superior to those found by MAXSON, et al. [2]: (1.16 kg / day for high tannin sorghum grain and 1.54 kg / day for low tannin sorghum grain) and RIFFEL [4]: 1.18 kg / day for low tannin sorghum grain and 1.54 kg / day for high tannin sorghum grain). The effect of interaction between sorghum grain and roughage management was not significant for carcass and meat traits. There was a significant effect of roughage management on ether extract (P<0.05), but there was not significant effect of roughage management on REA and BFT (P > 0.05).

Table 1 Adjusted means for weight and average daily weight gain according to treatments

Treatment ¹	Weight (kg)	Daily weight gain (kg/d)
WH-SP	421 a	1.51a
WH-RTM	411 ab	1.30ab
LT-SP	416 a	1.49a
LT-RTM	417 a	1.45a
HT-SP	418 a	1.52a
HT-RTM	396 b	1.15b

HT-SP - sorghum high tannin and roughage separate from concentrated; HT-RTM - sorghum high tannin and roughage mixed with concentrated; LT-SP - sorghum low tannin and roughage separate from concentrated; HT-RTM - sorghum low tannin and roughage mixed with concentrated; WH-SP - sorghum without tannin and white pericarp and roughage separate from concentrated; HT-RTM - sorghum low tannin and roughage mixed with concentrated

There was no significant effect of sorghum grain on MB, REA and BFT (Table 2). However, there was a significant effect of roughage management on marbling content (p < 0.05). The sorghum grain and roughage management did not affect the meat traits such as shear force, pH at 14 days and meat color (Table 3). The lack of significant differences in meat traits for sorghum grain is consistent with PORDOMINGO et al. [3].

Table 2 Adjusted means for loin ribeye area (REA), back fat thickness (BFT), marbling percentage (MB) by sorghum grain silage and roughage management

Sorghum	MB(%)	REA(cm ²)	BFT (mm)
WT	6.47	60.9	10.6
LT	6.74	60.0	9.92
HT	5.93	57.6	10.9
Roughage management			
SP	6.94a	58.6	10.3
RTM	5.82b	60.5	10.7

HT - sorghum high tannin; LT - sorghum low tannin; WH - sorghum without tannin and white pericarp; RTM - roughage mixed with concentrated; SP- roughage separate from concentrated.

Table 3 Adjusted means for shear force (SF) pH at 14 days and meat color (L *) (a *) (b *) by sorghum grain silage and roughage management

Sorghum	SF	a*	b*	L*	ph
WT	3.79	15.5	7.70	34.8	5.72
LT	4.01	13.8	7.24	34.6	5.68
HT	3.63	14.8	7.68	34.1	5.72
Roughage management					
SP	3.60	15.5	7.6	34.1	5.72
RTM	4.02	13.9	7.5	34.4	5.69

HT - sorghum high tannin; LT - sorghum low tannin; WH - sorghum without tannin and white pericarp; RTM - roughage mixed with concentrated; SP- roughage separate from concentrated.

• CONCLUSION

The roughage management may influence weight gain, depending on the type of sorghum used. Except for marbling content, the type of grain silage sorghum or roughage management did not affect meat and carcass traits.

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