

# Animal performance, *in vivo* digestibility and forage intake of beef steers grazing annual ryegrass varieties (*Lolium multiflorum* Lam.) differing in water soluble carbohydrate content, with and without corn supplementation



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## Introduction

Water soluble carbohydrate content (WSC) is one forage quality factor which affects forage digestibility, rumen microbial protein synthesis, diet intake and overall animal performance. Recently, efforts have been made to select varieties with higher WSC. However, most animal performance data utilizes lactating dairy cows and little is known about the impact of these varieties on beef stocker performance. Supplementation with energy feedstuffs may also interact with high WSC varieties. This study compared animal performance, forage intake and *in vivo* digestibility of beef steers grazing annual ryegrass varieties selected to have differential water soluble carbohydrate content, with and without supplementation with cracked corn.

## Materials and Methods

**Animals:** 24 steers (324 ± 15.7 kg initial BW)

**Experimental design and treatments:** The study was a split-plot design with ryegrass variety [Lonestar, (conventional) vs Enhancer, (high WSC)] as main plot and supplementation as sub-plot. Steers were assigned to one of four paddocks (2 replicates per variety<sup>1</sup>), with 6 animals per paddock. Within each paddock replicate, three animals were supplemented daily with cracked corn at 0.75% BW basis and three animals were not supplemented. Supplementation was provided individually using Calan gates (American Calan Inc., NH)

**Average daily gain** was calculated by weight difference between initial and final weight, using double unshrunk weights on consecutive days.

**Intake and digestibility:** Supplement intake was calculated by weighing orts daily. Titanium dioxide (TiO<sub>2</sub>) was used to estimate total DM and forage intake, and indigestible NDF was used to estimate DM and forage digestibility. Animals received daily oral administration of gelatin capsules containing 10 g TiO<sub>2</sub> during a

21-d period. Fecal grab samples were collected twice daily (150 g wet material/steer) during the last 6 d of digestion period. TiO<sub>2</sub> concentration in feces was assessed by H<sub>2</sub>SO<sub>4</sub> digestion and spectrophotometry (410 nm). Indigestible NDF was assessed by incubating forage and fecal samples in a Daisy Incubator (Ankom, USA) for 144 hours.

**Forage analysis** included WSC (colorimetric phenol- H<sub>2</sub>SO<sub>4</sub> assay), crude protein (combustion method), and NDF (Ankom 2000 fiber analyzer)

**Statistical analysis:** Performance data was analyzed with Proc Glimmix (SAS) in a model including variety, supplementation and two way interactions, with paddock as random factor.

<sup>1</sup> The study was originally intended to have 3 replicates per variety, but harsh climatic conditions affected the growth of some of the paddocks, reducing number of replicates

## Results

**Forage composition.** No differences ( $p>0.05$ ) in chemical composition (WSC, NDF and Crude protein) were found between varieties (Figure 1).

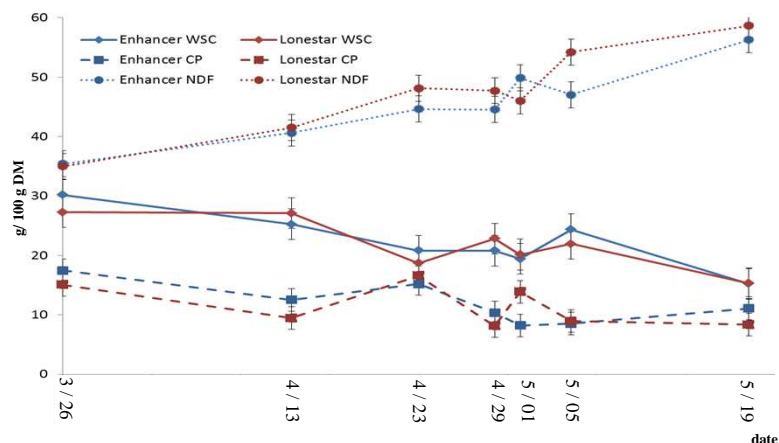
**Animal performance.** Initial animal weights differed slightly among forage and supplementation treatments; however, this was a result of initial random allotment of animals to treatment and training of supplemented steers to the Calan gate system prior to trial initiation. Neither ryegrass variety nor supplementation affected ( $p>0.05$ ) final weight or overall average daily gain, which were 484 ± 19.6 kg and 1.66 ± 0.144 kg/d, respectively. However, in the first 46 days of experiment, Enhancer tended ( $p=0.07$ ) to have a higher average daily gain than Lonestar (Table 1).

**Dry matter intake and *in vivo* digestibility.** No differences due to variety or supplementation were found in forage intake, total dry matter intake or *in vivo* digestibility ( $p>0.05$ , data not shown). However, for some animals, forage intake estimations were higher and showed higher variability than expected, due to a low recovery of the marker in feces, which led to overestimation of intake. These results were unexpected and their possible explanation remains unclear to us.

**Table 1.** Initial weight, final weight and average daily gain of steers grazing two varieties of annual ryegrass selected to have differential WSC, with or without cracked corn supplementation.

Ryegrass Variety	Enhancer High WSC		Lonestar Low WSC		Var	Suppl	VxS	SEM
	0	0.75	0	0.75				
Initial Weight (kg)	359.3	371.7	363.7	365.7	NS	<0.01	<0.01	0.93
Final Weight (kg)	481.7	488.1	481.5	484.9	NS	NS	NS	4.95
Total ADG (kg/d)	1.64	1.72	1.63	1.68	NS	NS	NS	0.069
<i>Period ADG</i>								
Day 0 to day 46 (kg/d)	1.84 bc	2.11 a	1.88 b	1.79 c	0.07	0.10	0.02	0.041
Day 46 do day 72 (kg/d)	1.28	1.12	1.19	1.48	NS	NS	NS	0.145

**Figure 1.** Water soluble carbohydrate, crude protein and neutral detergent fiber content of two varieties of annual ryegrass forage (Enhancer[High WSC] and Lonestar [Low WSC])



## Summary / Conclusions

- Under the conditions of this study, there were no differences in forage composition between ryegrass varieties. Late initiation of grazing due to an unseasonably cold winter may have been unfavorable for high WSC content in forage.
- The lack of differences in forage composition is consistent with the lack of differences in animal performance.
- We will repeat the study in 2014-2015 with a higher number of replicates (3/variety) to account for possible year effects.