Fibrolytic enzyme enhances feed efficiency of Nellore bulls when added to ensiling on corn-based silages

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Introduction

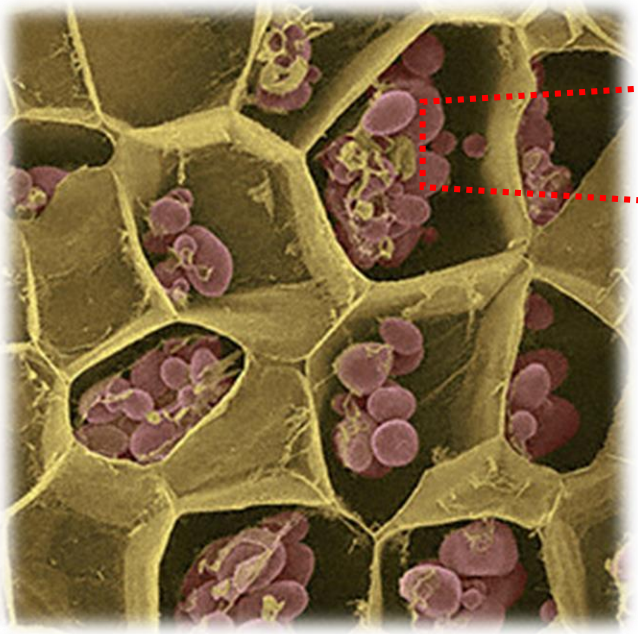
- Exogenous fibrolytic enzymes (EFE)
  - improved *in vitro* dry matter digestion (Phakachoed et al. 2013)

- Inconsistency of responses when used as feed additive
  - suboptimal condition of the rumen (Adesogan et al. 2014);
  - Temperature = 39ºC
  - pH = 6

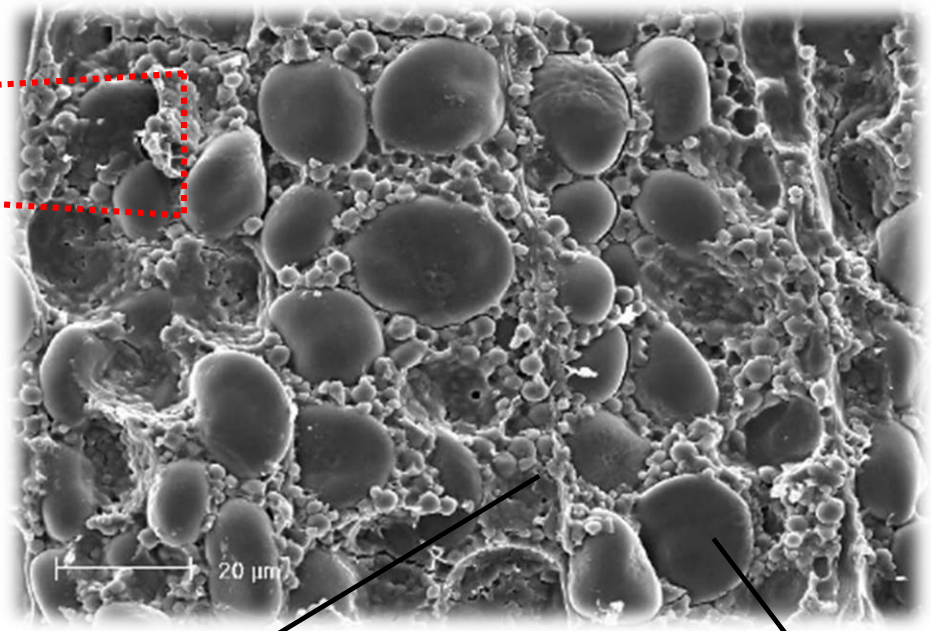
Hypothesis

- High moisture corn and snaplage could represent an environment, which enzymes could act properly (optimal temperature and pH) and improve silage quality and digestibility

Hypothesis



Kunkel (2008)



Black (2001)

Protein Matrix

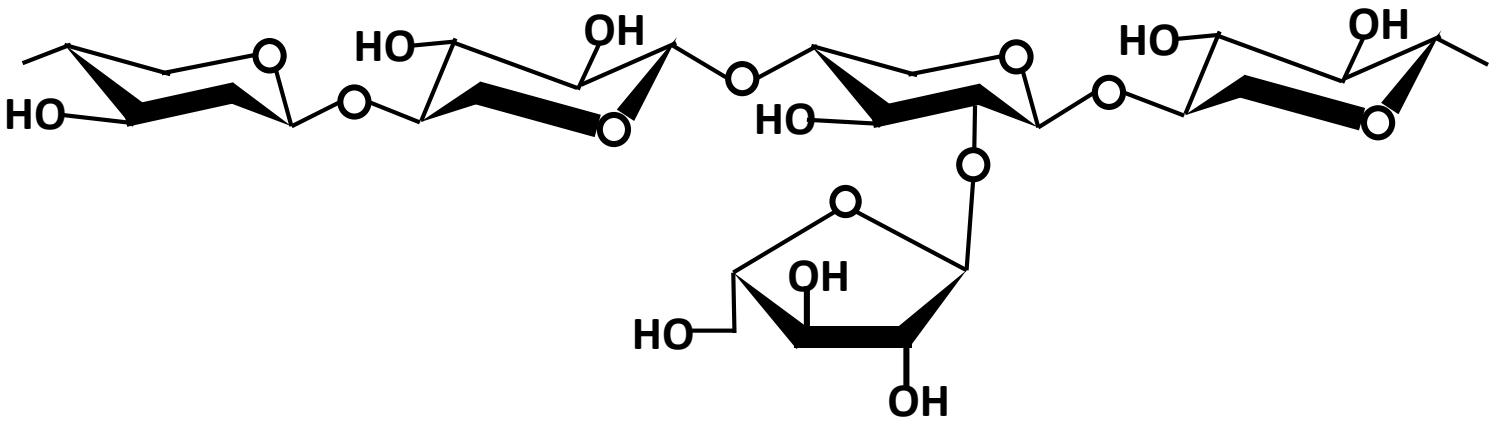
Starch Granules

Cage Effect

Hypothesis

- **α-Arabinofuranosidase**
- **Endo-1,4-ß-xylanase**

Xylose



Lafond et al. 2014

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Objective

- Evaluate the performance of Nellore bulls fed high moisture corn silage and snaplage with fibrolytic enzyme complex added for ensiling

Material and Methods

- **Rovabio Advance P®**
- *Talaromyces versatilis*
  - Endo-1,4-ß-xylanase
    - 25,000 VU/g
  - Endo-1,3(4)-ß-glucanase
    - 17,200 VU/g
- Dose - **100 g/ton** of Fresh Matter

Xylanases	Endo -1.4 β-xylanase β-xylosidase
B-glucanases	Endo - 1.3 1.4 β-glucanase Laminarinase
Debranching enzymes	α-arabinofuranosidase α-glucuronidase Ferulic acid esterase
Cellulases	Endo -1.4 β-glucanase Cellobiohydrolase β-glucosidase
Pectinases	Polygalacturonase Pectin esterase Endo -1.5 α-arabinanase α-galactosidase Rhamnogalacturonase
Proteases	Aspartic protease Metallo protease
Others	Endo -1.4 β-mannanase β-mannosidase

Material and Methods

Material and Methods

Snaplage Control

Snaplage added EFE

Material and Methods

HMC Control

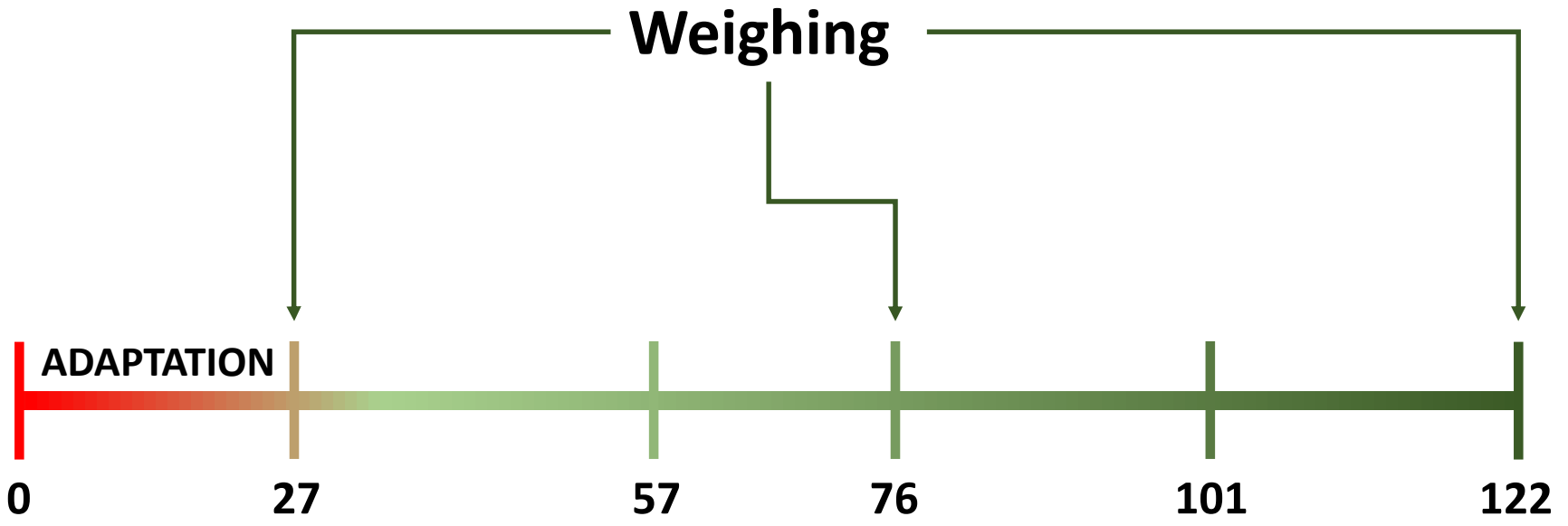
HMC added EFE

Material and Methods

- Randomized Complete Block
  - Factorial 2×2

- 467 intact Nellore Bulls
  - Initial weight ~ 420 kg
  - 16 pens – experimental units

Material and Methods



Dry matter intake - daily

Feed sampling - weekly

Material and Methods

Composition of experimental diets (DM)

Item	SNAP + HMC[1]		WPCS[2] + HMC	
	Control	Enzyme	Control	Enzyme
Whole Plant Corn Silage	-	-	25%	25%
Snaplage	27.65%	27.65%	-	-
High Moisture Corn	51.13%	51.13%	53.18%	53.18%
Soybean Hulls	12%	12%	12%	12%
Soybean Meal	5.42%	5.42%	6.02%	6.02%
Total Puraphós AEB (25% Urea)*	3.80%	3.80%	3.80%	3.80%
Nutrients				
Dry Matter	66.61%	66.31%	62.61%	62.10%
Ash	5.00%	5.04%	5.28%	5.33%
Crude Protein	13.56%	12.61%	12.99%	12.75%
Ether Extract	3.60%	3.66%	3.39%	3.47%
NDF	26.52%	27.84%	29.41%	29.39%
Starch	47.43%	47.10%	42.73%	43.93%
NFC	51.31%	50.85%	48.93%	49.07%

[1] Dose/animal – 1.05 g

[2]Dose/animal – 0.72 g; WPCS – not added EFE

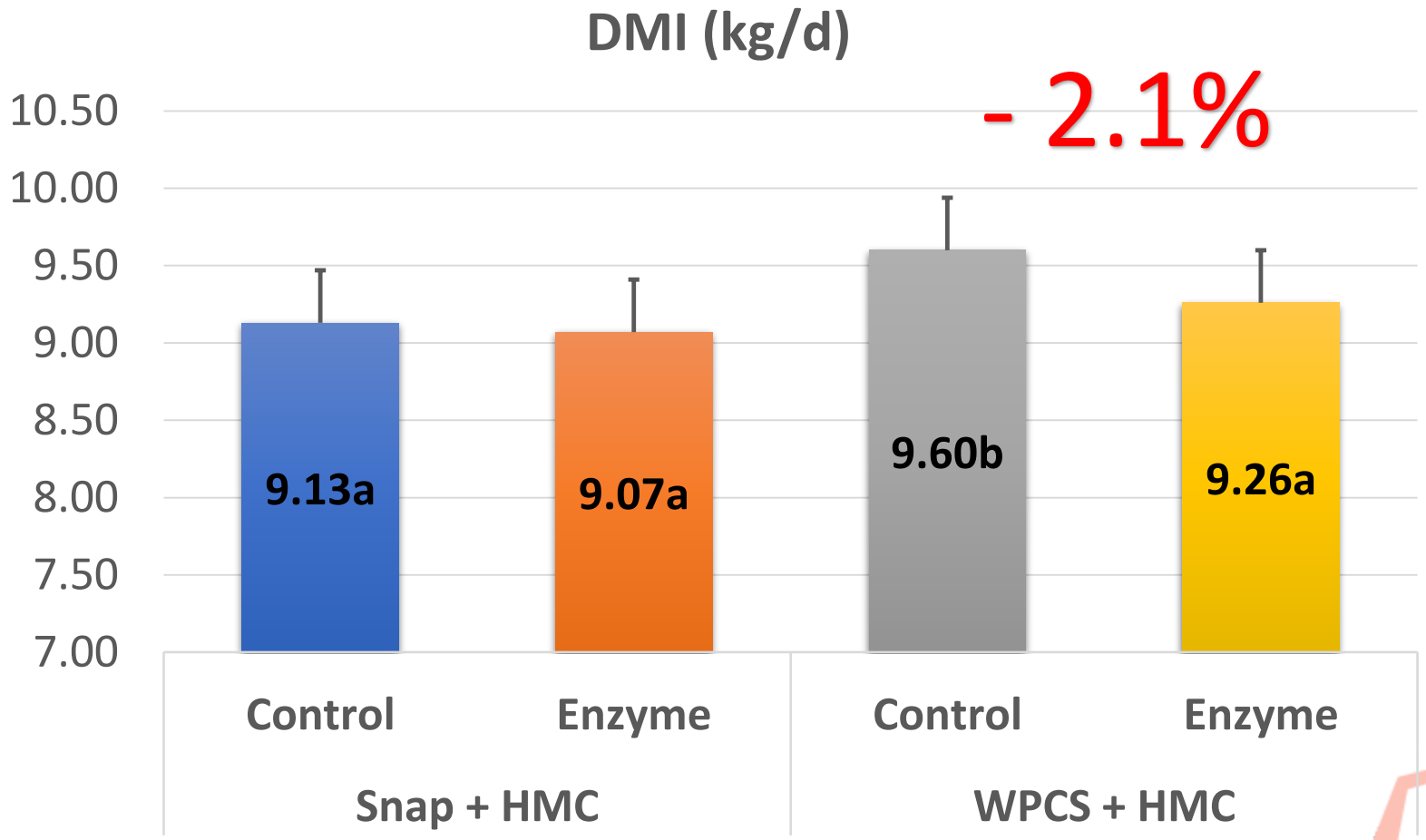
*Monensin – 800 mg/kg

Material and Methods

Daily Feed bunk score	Score description
-2	+ 1 kg of DM of diet/bull
-1	+ 0.5 kg of DM of diet/bull
0	+ 0.3 kg of DM of diet/bull
0.5	Quantity (DM) equal to the last day, after two following increases on diet offered
1	Quantity (DM) equal to the last day (target)
1.5	- 0.3 kg of DM of diet/bull
2	- 1 kg of DM of diet/bull
3	Manual adjustment to reach the score 1
Full	Night score for full feed bunk
Empty	Night score for empty feed bunk

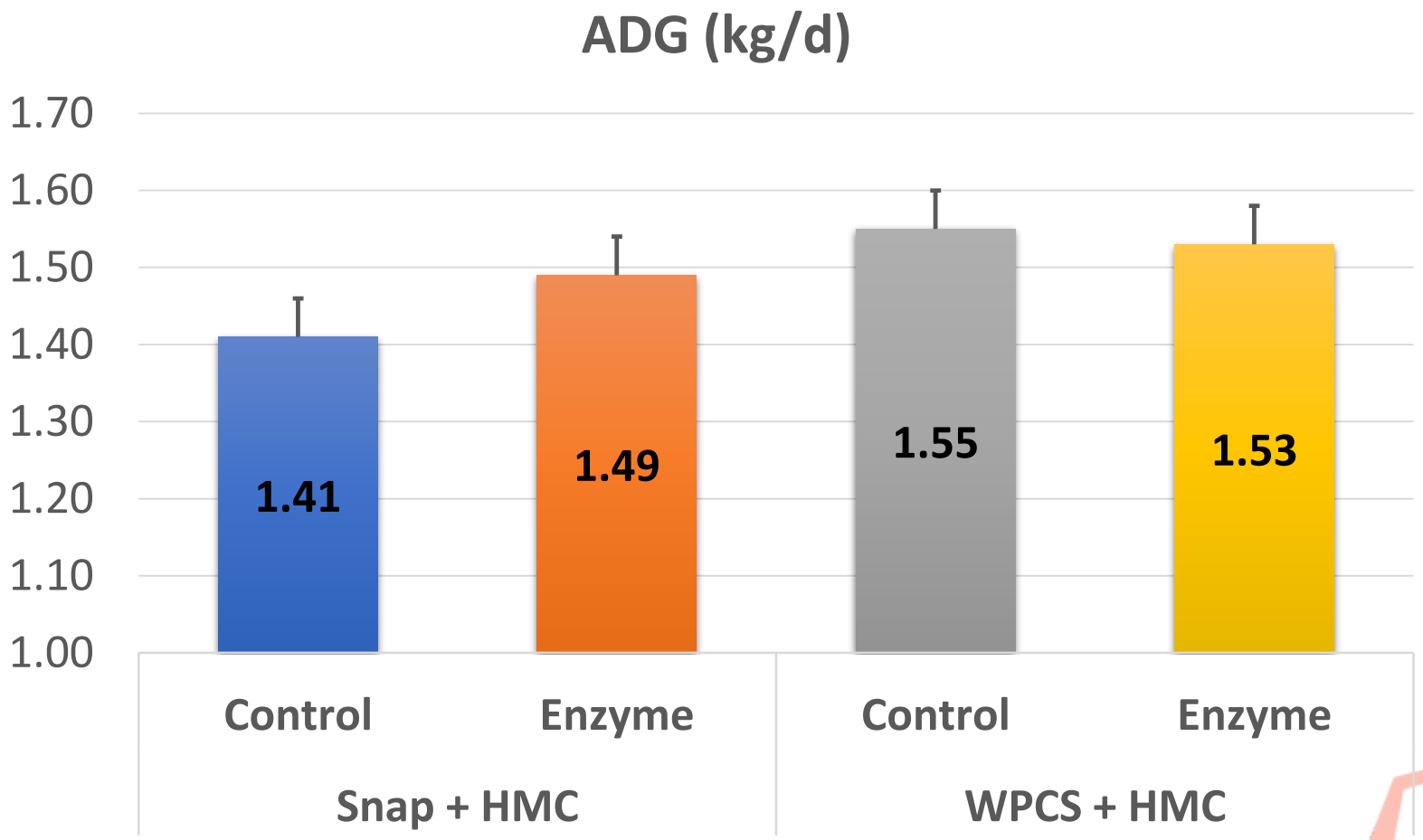
Results

Results



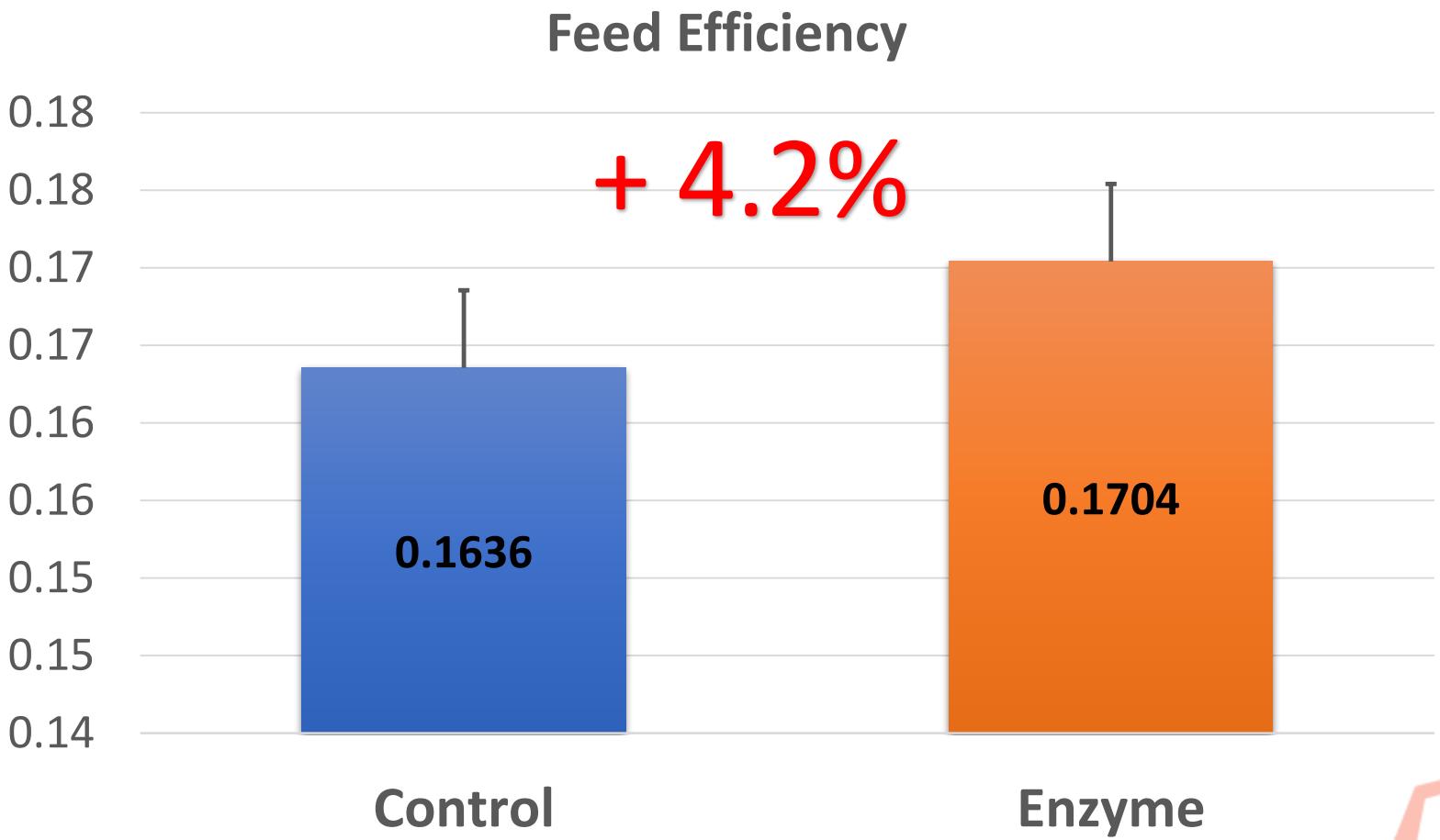
SEM – 0.34 ; Diet – P=0.001 ; Enzyme – P=0.0235 ; D*E – P=0.0913

Results



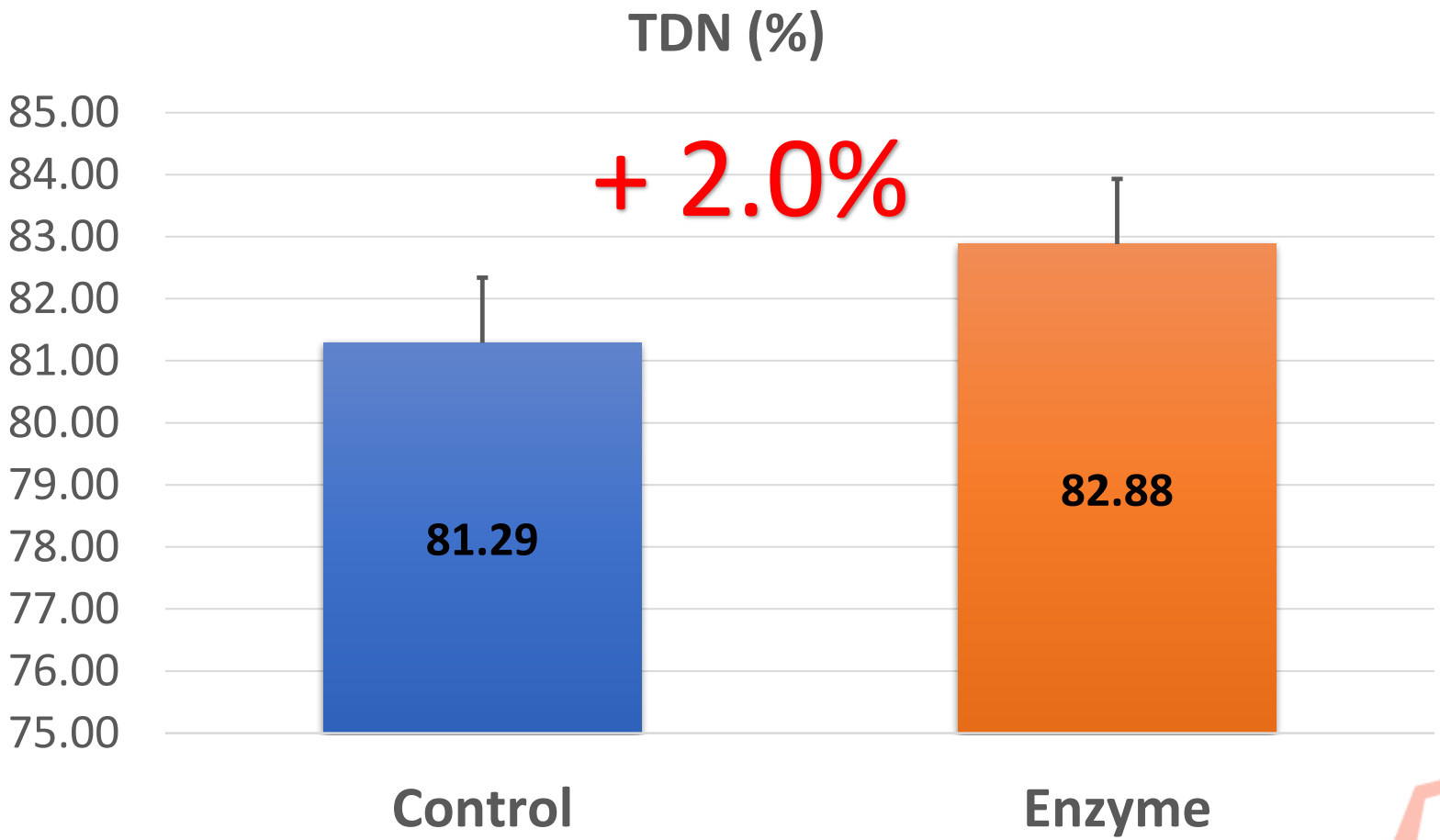
SEM – 0.05 ; Diet – P=0.0208 ; Enzyme – P=0.4742 ; D*E – P=0.1468

Results



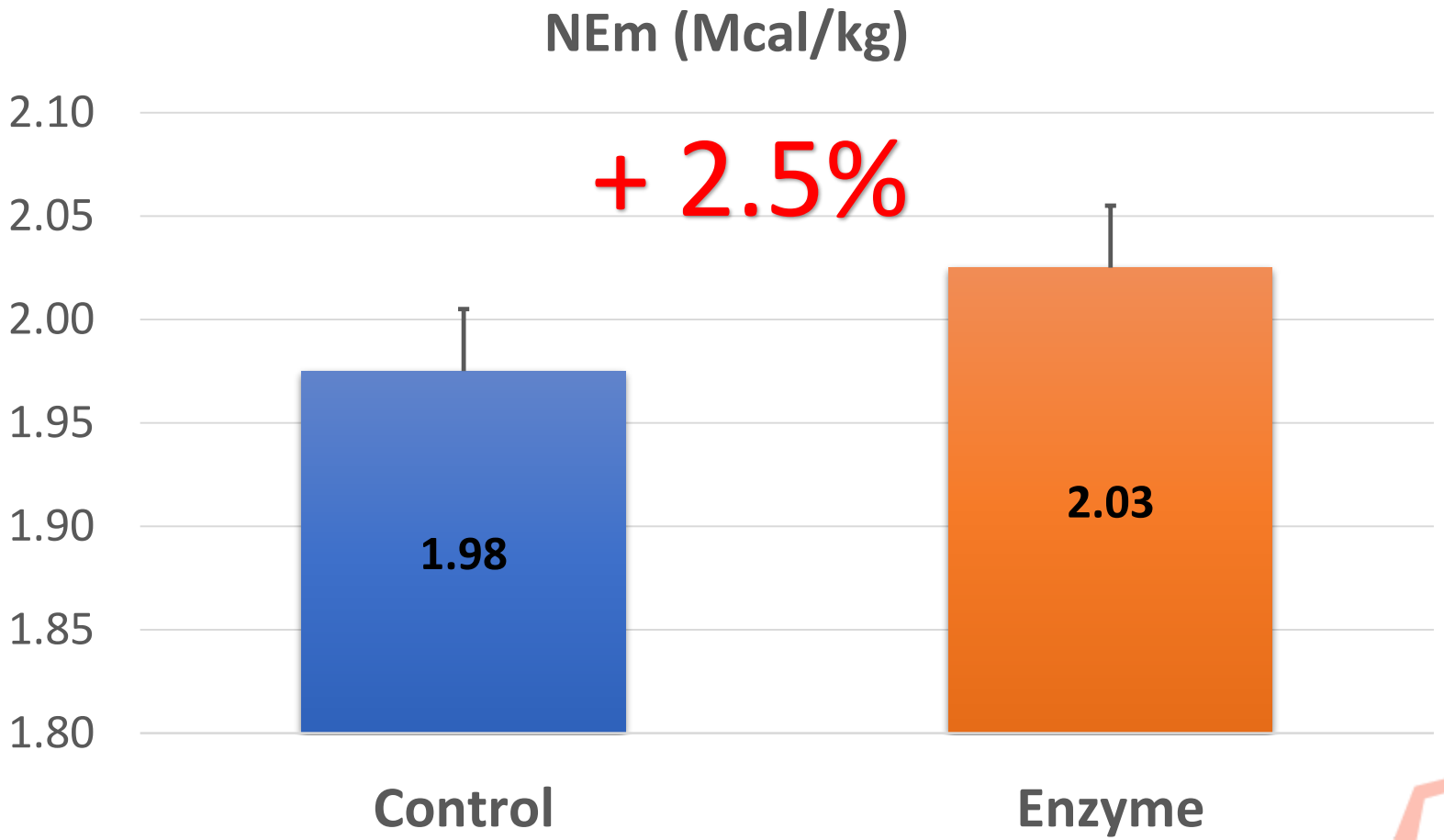
SEM – 0.005 ; Diet – P=0.3358 ; Enzyme – P=0.0792 ; D*E –P= 0.3978

Results



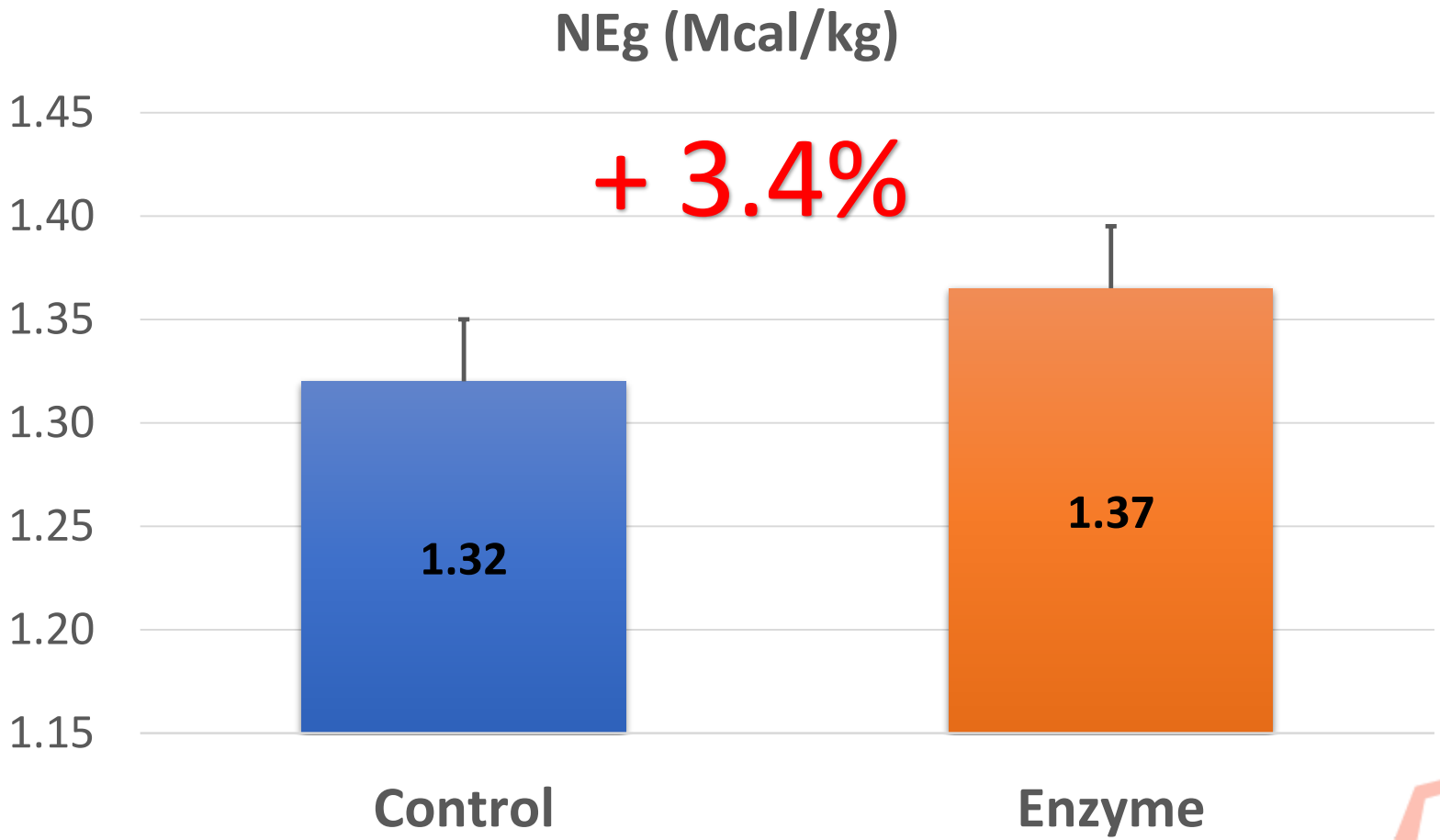
SEM – 1.05 ; Diet – P=0.7286 ; Enzyme – P=0.0791 ; D*E – P=0.4484

Results



SEM – 0.03 ; Diet – P=0.7291 ; Enzyme – P=0.0792 ; D*E – P=0.4484

Results



SEM – 0.03 ; Diet – P=0.7285 ; Enzyme – P=0.0791 ; D*E – P=0.4485

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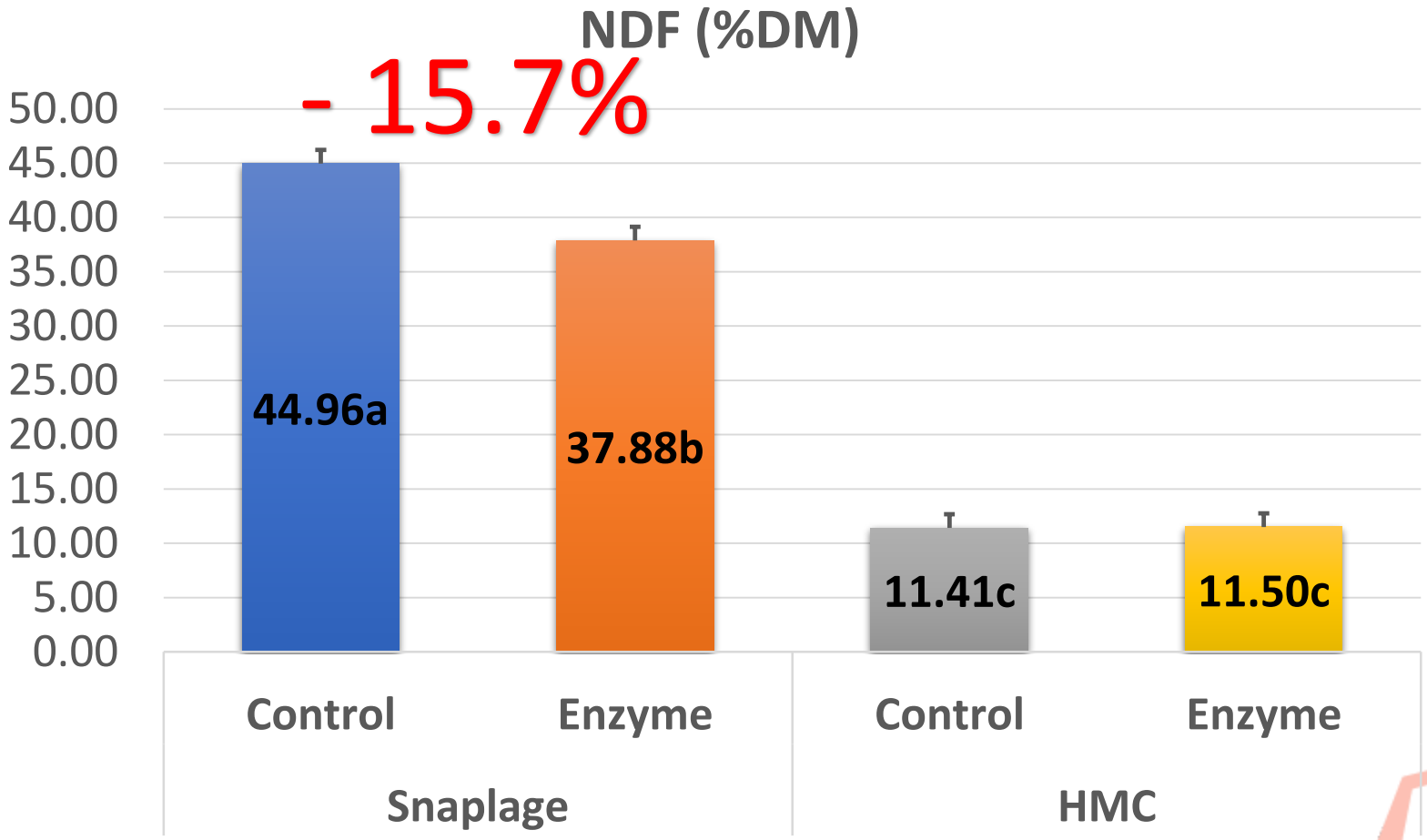
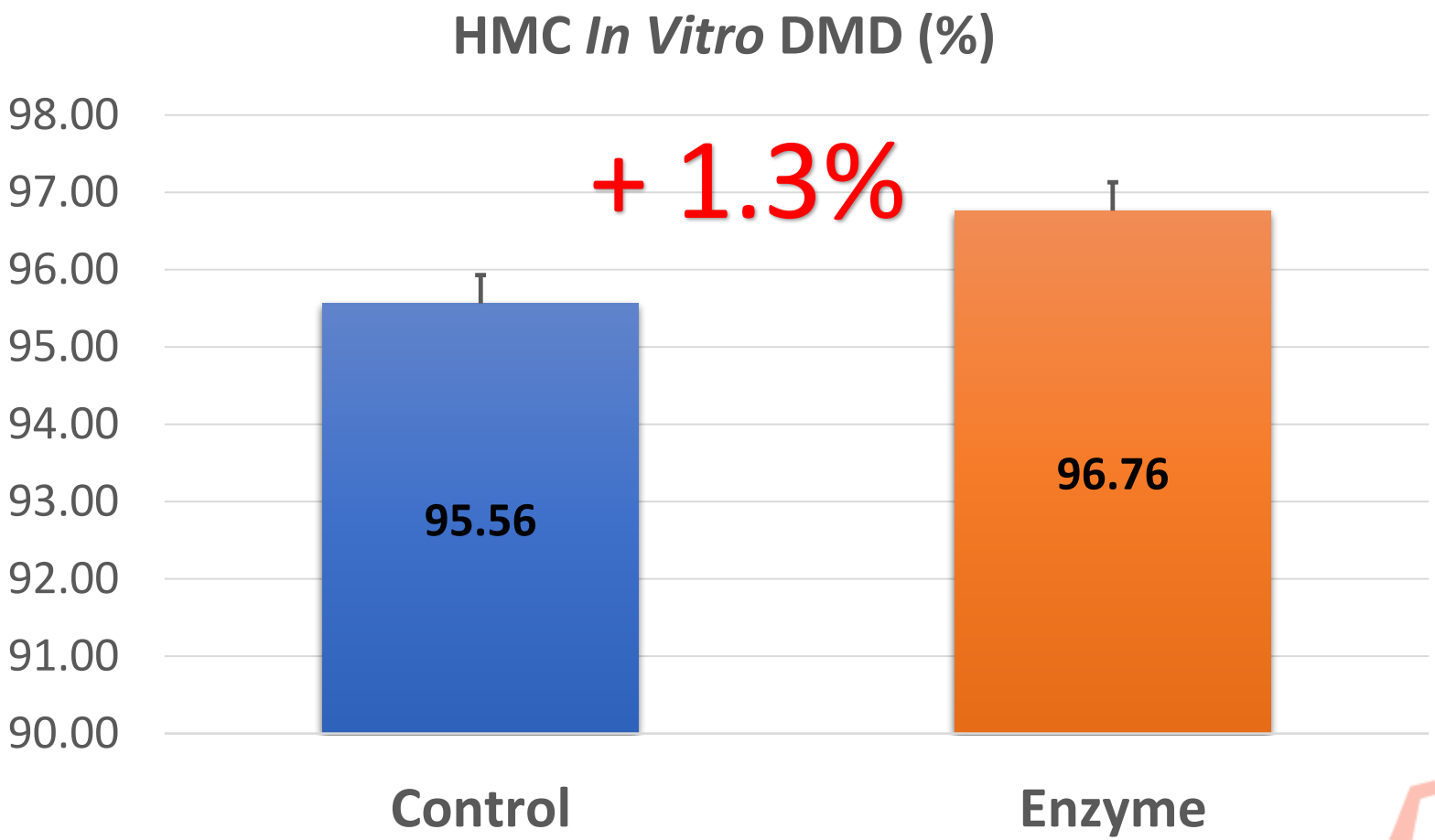
Results



SEM – 1.26 ; Silage – P<0.001 ; Enzyme – P=0.013 ; S*E – P=0.0112

Results



SEM – 0.37 ; Enzyme – P=0.0504

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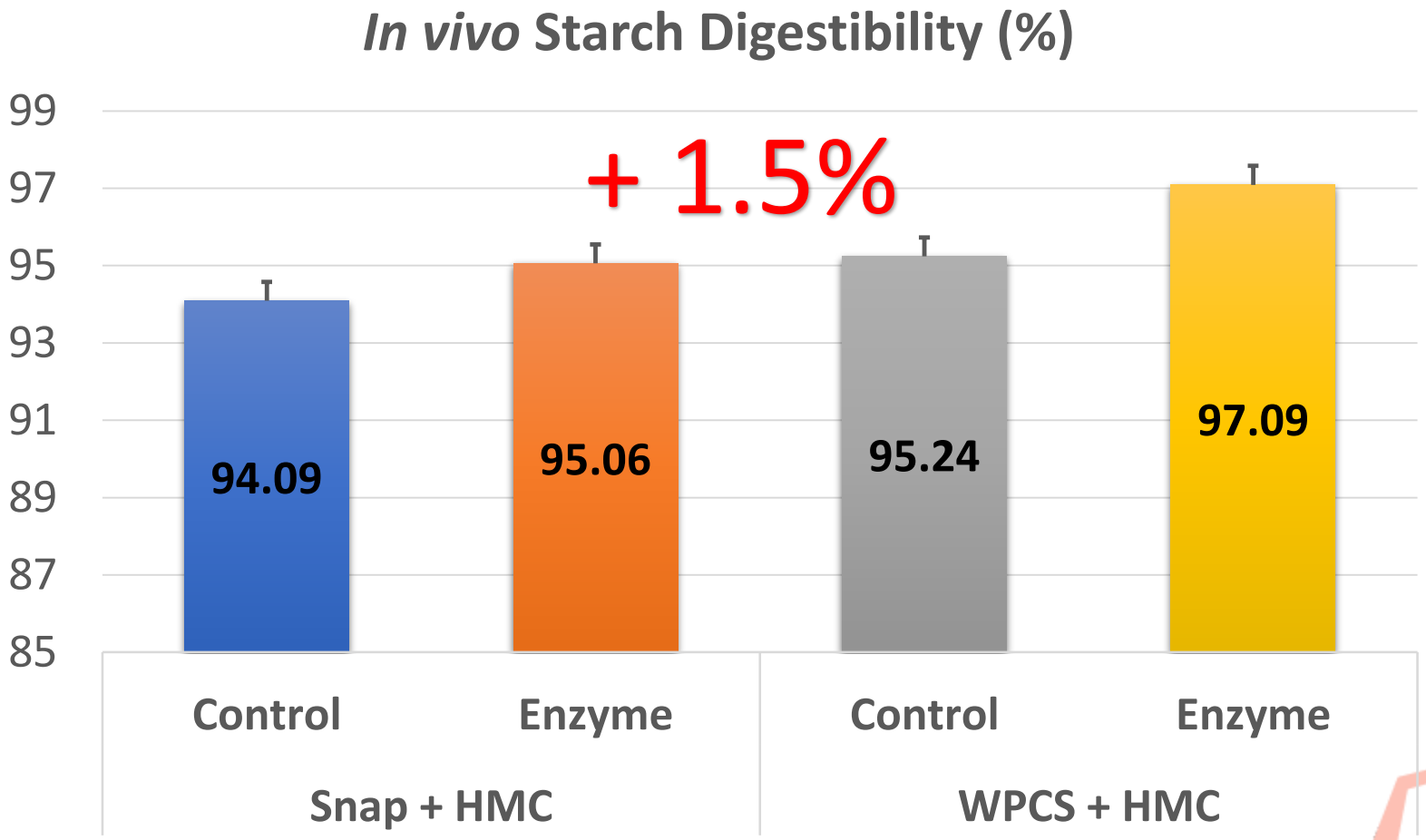
Results



SEM – 0.49 ; Diet – P=0.0043 ; Enzyme – P=0.0089 ; D*E – P=0.3463

Conclusion

- The addition of fibrolytic enzyme complex on corn-based silages can improve feed efficiency in beef cattle, probably due to the increase in the digestibility, by facilitating the access to the starch granules

Acknowledgments

Vielen Dank!

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