

Introduction

- Total collection of feed and feces is the “golden standard” to estimate digestibility but can be challenging, which makes internal markers practical
- Acid insoluble ash (AIA) is a naturally occurring internal digestibility marker measured within feed and feces (Van Keulen and Young, 1997)
- Published studies use inconsistent protocols to predict digestibility when using AIA as an internal digestibility marker
- Increased byproduct use in feedlot cattle diets (Samuelson et al., 2016) creates a need to evaluate methods for determining digestibility when using ingredients such as wet corn gluten feed

Objective

- To investigate the accuracy of various sampling frequencies when using AIA as a marker to calculate nutrient digestibility of beef feedlot receiving and finishing diets containing corn-milling byproducts

Materials and Methods

Study Procedures

- Procedures were approved by the WTAMU IACUC Committee
- 6 Angus × Hereford beef steers (3 diet replicates per period; 2 periods)
 - Crossover split-plot design with steer as the experimental unit
 - Period 1 = 304 ± 5.34 kg; Period 2 = 344 ± 4.72 kg
- 28-d periods:
 - 1 to 15 d: Diet transition and adaptation to treatment diets
 - 16 to 20 d: Introduction to metabolism stanchions
 - 21 to 28 d: 7-d collection period
- Dietary treatments:
 - Steam-flaked corn-based beef-feedlot diets: **REC**, **FIN** (Table 1)
 - Limit fed 2.0% of BW to mitigate residual feed refusals
- Sampling method treatments:
 - **TC**, **1AIA**, **3AIA**, **5AIA**, **7AIA**
- Daily collections consisted of:
 - Total collection of feed and feces and 12 h rectal-grab samples

Laboratory Procedures

- Feed, feed refusals and feces were analyzed for:
 - Dry Matter (DM), Organic Matter (OM), Neutral Detergent Fiber (NDF), Acid Detergent Fiber (ADF), and Acid Insoluble Ash (AIA) concentrations

Statistical Analysis

- All data was analyzed using the MIXED procedure of SAS
- Model included the effects of sequence, diet, collection method, and diet × collection method
- Period and animal within period × sequence × diet combination were random



Table 1. Diet composition of treatment diets

Item	Treatments	
	REC ⁴	FIN ⁵
<i>Ingredient, % of DM</i>		
Corn Grain, Flaked	32.54	58.55
Corn Stalks	19.00	8.00
Sweet Bran ¹	38.00	20.00
Molasses Blend ²	7.00	5.00
Corn Oil	0.00	3.00
Limestone	0.00	1.05
Urea	0.00	0.90
Supplement	3.46	3.50
<i>Nutrient Composition, DM basis³</i>		
DM, %	70.02	76.55
TDN, %	75.90	88.50
CP, %	14.20	13.10
NDF, %	32.89	19.07
ADF, %	14.81	7.37
Ca, %	1.15	0.80
P, %	0.49	0.35
NE _m , Mcal/kg	1.83	2.20
NE _g , Mcal/kg	1.19	1.52

¹ Wet corn gluten feed (Sweet Bran, Cargill animal Nutrition, Bovina, TX)

² 72 Brix Molasses Blend (Westway Feed Products LLC, Hereford, TX)

³ Analysis completed by a commercial laboratory (Servi-Tech Laboratories, Hastings, NE) or in the West Texas A&M University Ruminant Nutrition Laboratory.

⁴ REC formulated to meet or exceed NRC requirements for vitamins and minerals (NRC, 1989) and supplied 24 mg/kg monensin sodium on a DM basis.

⁵ FIN formulated to meet or exceed NRC requirements for vitamins and minerals (NRC, 1989) and supply 43 mg/kg monensin sodium and 11 mg/kg tylosin phosphate on a DM basis.



Digestibility Results

Figure 1. Comparisons of percent nutrient digestibility between treatment diets

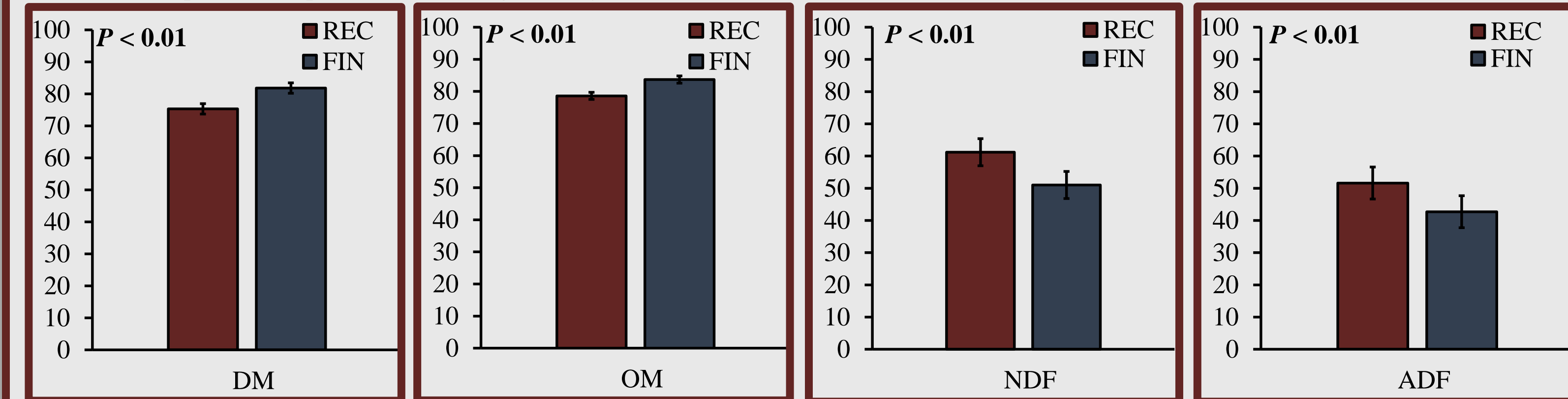


Figure 2. Comparisons of DM and OM digestibility between marker methods, %

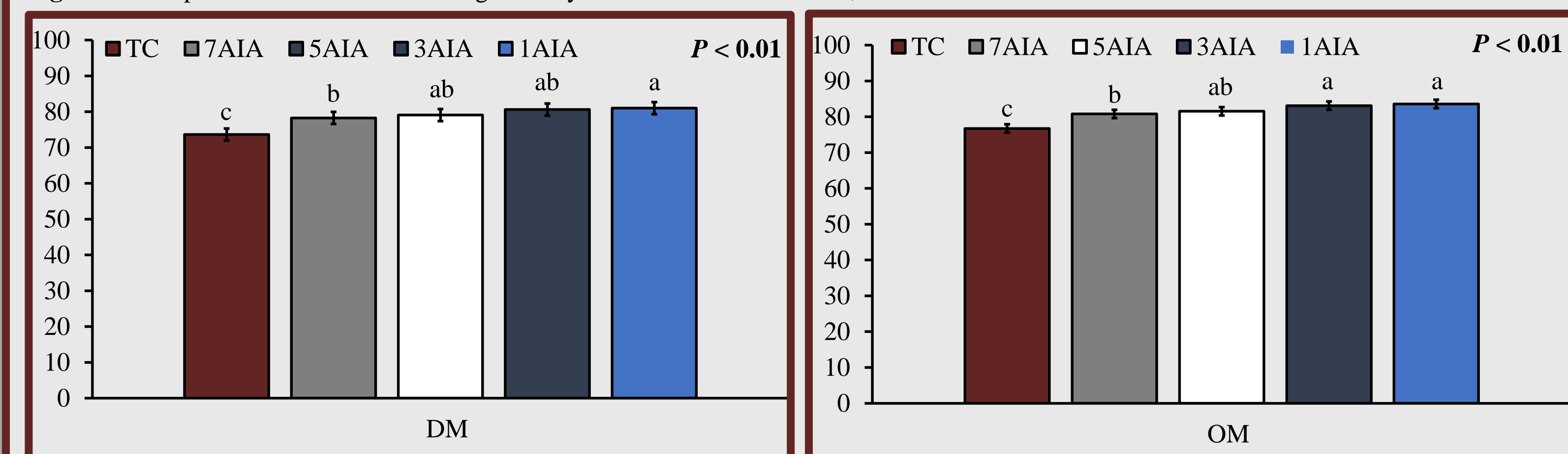
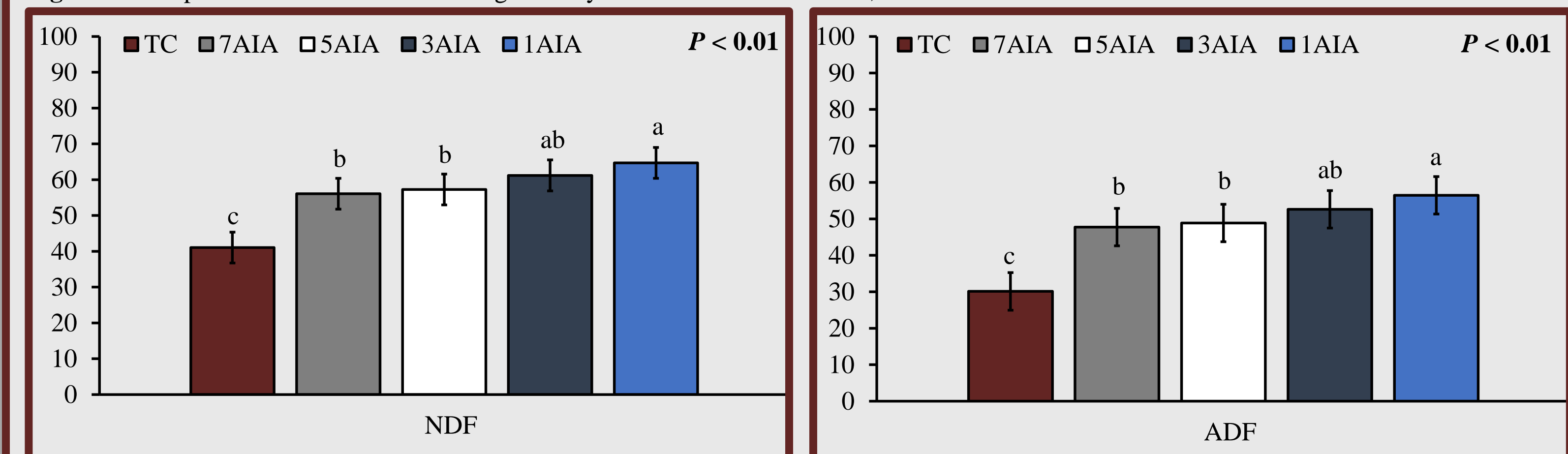


Figure 3. Comparisons of NDF and ADF digestibility between marker methods, %



Discussion and Conclusions

- When grain-milling byproducts such as wet corn gluten feed are included in feedlot diets:
 - Digestibility of DM and OM is greatest for finishing diets
 - Digestibility of NDF and ADF is greatest for receiving diets
- Using AIA as a method to determine digestibility is not as accurate as total collection of feed and feces and will over estimate digestibility of feedlot diets
- Accuracy of digestibility estimates using AIA as a marker were improved as the number of collection days increased

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