

EFFECT OF AMAFERM[®] ON IN VITRO FIBER DEGRADATION

A. A. Beharka and T. G. Nagaraja

AMAFERM increases fiber digestibility of multiple species of forages.

SUMMARY

DOSE OF AMAFERM USED

0.4, 0.8, or 1.2 g/L
of fermentation mixture

AMAFERM stimulated the 96-hour NDF and ADF degradation of alfalfa hay, bromegrass hay and high endophyte fescue. Results of this study suggested that AMAFERM's effect on fiber digestion was mainly through the activity of ruminal bacteria.

VALUE

Bacteria play a crucial role in digestion. Therefore, supplementing with AMAFERM can increase overall digestion since bacterial growth is also stimulated by AMAFERM supplementation.

PROTOCOL

Type of Animals/Experimental Units

- In vitro batch culture fermentation with mixed rumen microorganisms

Number of Animals/Experimental Units

- One rumen cannulated Holstein steer as donor cow. Fermentation was in triplicate, and the experiment was repeated 3 times

Trial Design

- Experiment 1: Randomized complete block design
- Experiment 2: Split-plot design

PROTOCOL (CONTINUED)

Treatments

- **Experiment 1:** 8 substrates tested for 96-hour NDF and ADF degradation: alfalfa hay, bromegrass hay, high endophyte fescue, low endophyte fescue, pure cellulose, wheat straw, corn silage, and prairie hay (predominantly big bluestem, little bluestem and Indiangrass)
- **Experiment 2:** To assess the influence of AMAFERM on microbial contribution to fiber degradation, 3 substrates showing positive response on NDF/ADF degradation with the addition of AMAFERM addition in experiment 1 (alfalfa hay, bromegrass hay and high endophyte fescue) were used with antimicrobial compounds – 2000 U/ml penicillin G and 150 U/ml streptomycin sulfate to inhibit bacteria, and 0.5 mg/ml cycloheximide to inhibit fungi and possibly protozoa. Nine treatments were used for each substrate:
 1. substrate, buffer and AMAFERM
 2. substrate and whole rumen fluid (WRF)
 3. substrate, buffer, WRF and AMAFERM
 4. substrate, buffer, WRF and antifungal compound
 5. substrate, buffer, WRF and antibacterial compounds
 6. substrate, buffer, WRF and antibacterial and antifungal compounds
 7. substrate, buffer, WRF, AMAFERM, and antibacterial compounds
 8. substrate, buffer, WRF, AMAFERM, and antifungal compounds
 9. substrate, buffer, WRF, AMAFERM, antibacterial compounds and antifungal compounds

Diet Information

- 80:20 alfalfa hay and concentrate diet fed to donor cow

Data Collection

- 96-hour NDF and ADF degradability

DISCUSSION OF RESULTS

- Addition of AMAFERM increased 96-hour NDF and ADF degradation of alfalfa hay, bromegrass hay and high endophyte fescue (Table 1) but had no effect on pure cellulose, corn silage, low endophyte fescue, prairie hay and wheat straw (data not shown in the table)

DISCUSSION OF RESULTS (CONTINUED)

- The extent of NDF and ADF degradation was similar between the whole rumen fluid (WRF with entire microbial population) and WRF plus cycloheximide (bacterial population) treatments. Fermentation treated with penicillin and streptomycin (fungal population) had lower NDF and ADF degradation (Tables 2 and 3). These results indicated that bacterial activity was responsible for the majority of fiber degradation
- Fungal activity alone was responsible for 25%-33% of the NDF, and 13%-18% of the ADF degradability in this study. These numbers might be overestimated, because colonization of forages by fungi was greater when bacterial activity was inhibited by antimicrobial compounds
- The NDF and ADF degradation of bromegrass and alfalfa hay was increased 7%-12% and 12%-15%, respectively, by the addition of AMAFERM to WRF fermentation (Tables 2 and 3)
- The addition of AMAFERM to the WRF plus cycloheximide (bacteria) increased NDF and ADF degradation of alfalfa hay, bromegrass hay and high endophyte fescue, while the addition of AMAFERM to the WRF plus penicillin and streptomycin (fungi and protozoa) had no effect – indicating that the effect of AMAFERM was mainly through the activity of bacteria rather than fungi or protozoa

<i>Table 1</i> Effect of AMAFERM supplementation on <i>in vitro</i> NDF and ADF degradability	% of NDF Digested			
		Alfalfa Hay	Bromegrass Hay	High Endophyte Fescue
	Control	36.5 ^b	52.7 ^b	59.1 ^b
	0.4 g/L AMAFERM	40.2 ^{ab}	56.5 ^{ab}	65.0 ^a
	0.8 g/L AMAFERM	42.0 ^a	57.6 ^a	65.2 ^a
1.2 g/L AMAFERM	42.9 ^a	58.3 ^a	61.3 ^{ab}	
	% of ADF Digested			
Control	25.0 ^a	28.8 ^b	30.5 ^b	
0.4 g/L AMAFERM	27.7 ^{ab}	31.1 ^{ab}	34.2 ^a	
0.8 g/L AMAFERM	27.9 ^{ab}	32.5 ^a	34.4 ^a	
1.2 g/L AMAFERM	28.0 ^a	32.7 ^a	31.2 ^{ab}	

^{a, b} Column means within a category (NDF or ADF) with different superscripts differ ($P < 0.1$)

<p>Table 2 Effect of AMAFERM and antimicrobial supplementation on in vitro NDF degradability</p>	% of NDF Digested by Bacteria, Fungi, Protozoa and WRF			
		Alfalfa Hay	Bromegrass Hay	High Endophyte Fescue
	0 g/L AMAFERM	37.8 ^a	55.4 ^a	60.0 ^a
	0.4 g/L AMAFERM	42.2 ^b	56.8 ^{ab}	64.3 ^b
	0.8 g/L AMAFERM	42.3 ^b	60.3 ^{bc}	65.5 ^b
	1.2 g/L AMAFERM	43.0 ^b	61.5 ^c	59.2 ^a
	% of NDF Digested by Bacteria (WRF plus cycloheximide)			
	0 g/L AMAFERM	32.1 ^a	50.8 ^a	57.0 ^b
	0.4 g/L AMAFERM	37.8 ^b	55.9 ^b	62.4 ^b
	0.8 g/L AMAFERM	37.6 ^b	51.6 ^b	64.9 ^b
1.2 g/L AMAFERM	39.2 ^b	56.3 ^b	55.2 ^a	
% of NDF Digested by Fungi and Protozoa (WRF, penicillin and streptomycin)				
0 g/L AMAFERM	37.8 ^a	55.4 ^a	60.0 ^a	
0.4 g/L AMAFERM	42.2 ^b	56.8 ^{ab}	64.3 ^b	
0.8 g/L AMAFERM	42.3 ^b	60.3 ^{bc}	65.5 ^b	
1.2 g/L AMAFERM	43.0 ^b	61.5 ^c	59.2 ^a	

^{a, b} Column means within each treatment with different superscripts differ ($P < 0.1$)

<p>Table 3 Effect of AMAFERM and antimicrobial supplementation on in vitro ADF degradability</p>	% of NDF Digested by Bacteria, Fungi, Protozoa and WRF			
		Alfalfa Hay	Bromegrass Hay	High Endophyte Fescue
	0 g/L AMAFERM	25.7 ^b	29.4 ^b	60.0 ^a
	0.4 g/L AMAFERM	28.7 ^a	33.0 ^{ab}	64.3 ^b
	0.8 g/L AMAFERM	28.8 ^a	33.8 ^a	65.5 ^b
	1.2 g/L AMAFERM	28.9 ^a	34.3 ^a	59.2 ^a
	% of NDF Digested by Bacteria (WRF plus cycloheximide)			
	0 g/L AMAFERM	24.1 ^b	26.8 ^b	57.0 ^b
	0.4 g/L AMAFERM	28.5 ^a	30.6 ^a	62.4 ^b
	0.8 g/L AMAFERM	27.2 ^{ab}	33.1 ^a	64.9 ^b
1.2 g/L AMAFERM	27.6 ^a	33.3 ^a	55.2 ^a	
% of NDF Digested by Fungi and Protozoa (WRF, penicillin and streptomycin)				
0 g/L AMAFERM	13.5	15.1	16.8	
0.4 g/L AMAFERM	13.9	16.8	18.0	
0.8 g/L AMAFERM	14.0	15.7	17.2	
1.2 g/L AMAFERM	14.3	14.3	15.9	

^{a, b} Column means within each treatment with different superscripts differ ($P < 0.1$)

BIOZYME INCORPORATED

6010 Stockyards Expy I St. Joseph, MO 64504 USA

Tel: 816-238-3326 | Fax: 816-238-7549

support@biozymeinc.com | www.biozymeinc.com

