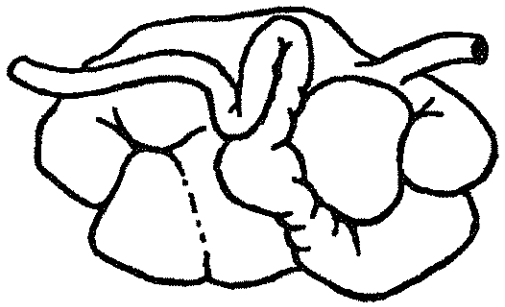
Abstracts and Program

Conference on Rumen Function

Volume 21



40 Years of Interaction

1951-1991

21st Biennial Conference on Rumen Function
Chicago, Illinois
November 12-14, 1991

21st BIENNIAL
CONFERENCE ON RUMEN FUNCTION
1951-1991

Welcome to the 21st Biennial Conference on Rumen Function. The Rumen Function Conference has been meeting in the Congress Hotel since November 1951. The discussions originally focused on the problem of bloat, and this aspect of rumen function was a central theme until 1961. Since this time, the Conference has broadened its program to other factors which influence rumen fermentation and physiology.

In the early days, the panel discussions were informal presentations of recent observations and theories. As the Conference grew in attendance, the participants were asked to deliver more formal podium presentations. A poster session was added in 1987.

H. W. Marston, ARC/USDA, served as Conference Chairman from 1951 until 1957 and from 1961 to 1965. N. R. Ellis, ARC/USDA, was Chairman of the 1959 meeting. C. R. Richard, CSRS/USDA, assumed the Chairmanship in 1967 and served until 1983. M. J. Allison, ARS/USDA then served as Chairman from 1985 to 1989.

I hope that this current Conference will provide a stimulating and interesting forum .

Sincerely,

James B. Russell
Research Microbiologist
ARS/USDA

#54 EFFECTS OF Aspergillus oryzae EXTRACT (AMAFERM) ON RUMINAL FIBROLYTIC BACTERIA AND IN VITRO FIBER DEGRADATION. A.A. Beharka* and T.G. Nagaraja, Dept. of Animal Sci., Kansas State University, Manhattan, Kansas 66506 (613-532-5654)

The effect of Amaferm on growth of pure cultures of ruminal cellulolytic, hemicellulolytic and pectinolytic bacteria (*Fibrobacter succinogenes*, *Butyrivibrio fibrisolvens*, *Eubacterium cellulosolvens*, *Ruminococcus flavefaciens*, *R. albus*, *Prevotella* (*Bacteroides*) *ruminicola*, and *Lachnospira multiparus*) was determined. Bacteria were grown in anaerobic, complete carbohydrate rumen fluid medium with filter-sterilized Amaferm at 0, 2 or 5% of the medium. The medium was inoculated with late-log-phase culture and growth was monitored by measuring absorbance. The addition of Amaferm to the medium increased (P<.1) the specific growth rate of *Ruminococcus albus* (.71 vs .61) and *Fibrobacter succinogenes* (.35 vs .26). Amaferm had no effect on growth of other fibrolytic bacteria. Selective antimicrobial compounds (penicillin, streptomycin, and cycloheximide) were used to assess the influence or Amaferm on bacterial and fungal contributions to in vitro fiber degradation. A variety of ground, fibrous substrates (0.5g) were incubated with ruminal fluid inoculum (1:2 ruminal fluid to buffer). Amaferm was added at 0, .4, .8 or 1.2 g/l. NDF and ADF digestibilities were determined after 96 h incubation. Addition of Amaferm increased (P<.1) NDF and ADF digestion of brome, and alfalfa hay. Amaferm addition at .4 or .8 g/l, and not 1.2 g/l, increased NDF and ADF digestion of high endophyte fescue. The enhanced fiber degradation by Amaferm was attributed to its stimulation of bacterial activity. Amaferm did not appear to stimulate fungal activity. Addition of Amaferm had no effect on NDF or ADF digestion of pure cellulose, low endophyte fescue, wheat straw, corn silage and prairie hay. In conclusion, Amaferm appears to stimulate NDF and ADF digestibility of certain feedstuffs and this increase in digestibility maybe a consequence of growth stimulation of some fibrolytic bacteria.

INTRODUCTION

1. Amaferm supplementation has been reported to:
   - increase fiber digestibility.
   - increase total and fibrolytic bacterial numbers.
   - increase VFA concentration.
2. It has been proposed that Amaferm supplementation may increase the nutritive value of feedstuffs by increasing the digestion of dietary fiber.
3. Little work has been done to determine which fibrolytic bacteria are being stimulated.
4. The effect of Amaferm on the ruminal protozoa and fungi populations is unknown.
   - The fungal population has been shown to have high fiber digesting ability.
   - Inhibition of the protozoa population which can prey on bacteria may account for increased bacterial numbers.

OBJECTIVE

To determine the effect of Amaferm on the growth rate of selected pure cultures of ruminal bacteria, with and without antimicrobial compounds and on the extent of degradation of forage components by the different microbial populations.

PROCEDURES

A. THE EFFECT OF AMAFERM ON BACTERIAL GROWTH

1. Pure cultures of ruminal bacteria were grown in anaerobic, complete carbohydrate rumen fluid medium with filter sterilized Amaferm at 0, 2 or 5% of the medium.
2. The medium was inoculated with a late-log-phase culture.
3. Growth was monitored by measuring absorbance.

B. THE INFLUENCE OF AMAFERM ON BACTERIAL AND FUNGAL CONTRIBUTION TO IN VITRO FIBER DEGRADATION

1. A variety of ground fibrous substrates (alfalfa hay, brome hay, high and low endophyte fescue hay, pure cellulose, wheat straw, corn silage and prairie hay (0.5g) were incubated with ruminal fluid inoculum (1:2 rumen fluid to buffer).
2. Amaferm was added at 0, 4, 8 or 1.2 g/l.
3. Selective antimicrobial compounds were added: penicillin G (P) streptomycin sulfate (S) and cycloheximide (C).
4. Treatements were as follows (in triplicate):
   a. substrate + buffer (B)
   b. substrate + rumen fluid (RF) + B
   c. substrate + RF + B + Amaferm
   d. substrate + B + Amaferm
   e. substrate + RF + B + P + S
   f. substrate + RF + B + P + S + Amaferm
   g. substrate + RF + B + C
   h. substrate + RF + B + C + Amaferm
   i. substrate + RF + B + P + S + C
   j. substrate + RF + B + P + S + C + Amaferm
5. NDF and ADF digestibilities were determined after 96 H.

EFFECT OF AMAFERM ON BACTERIAL SPECIFIC GROWTH RATE

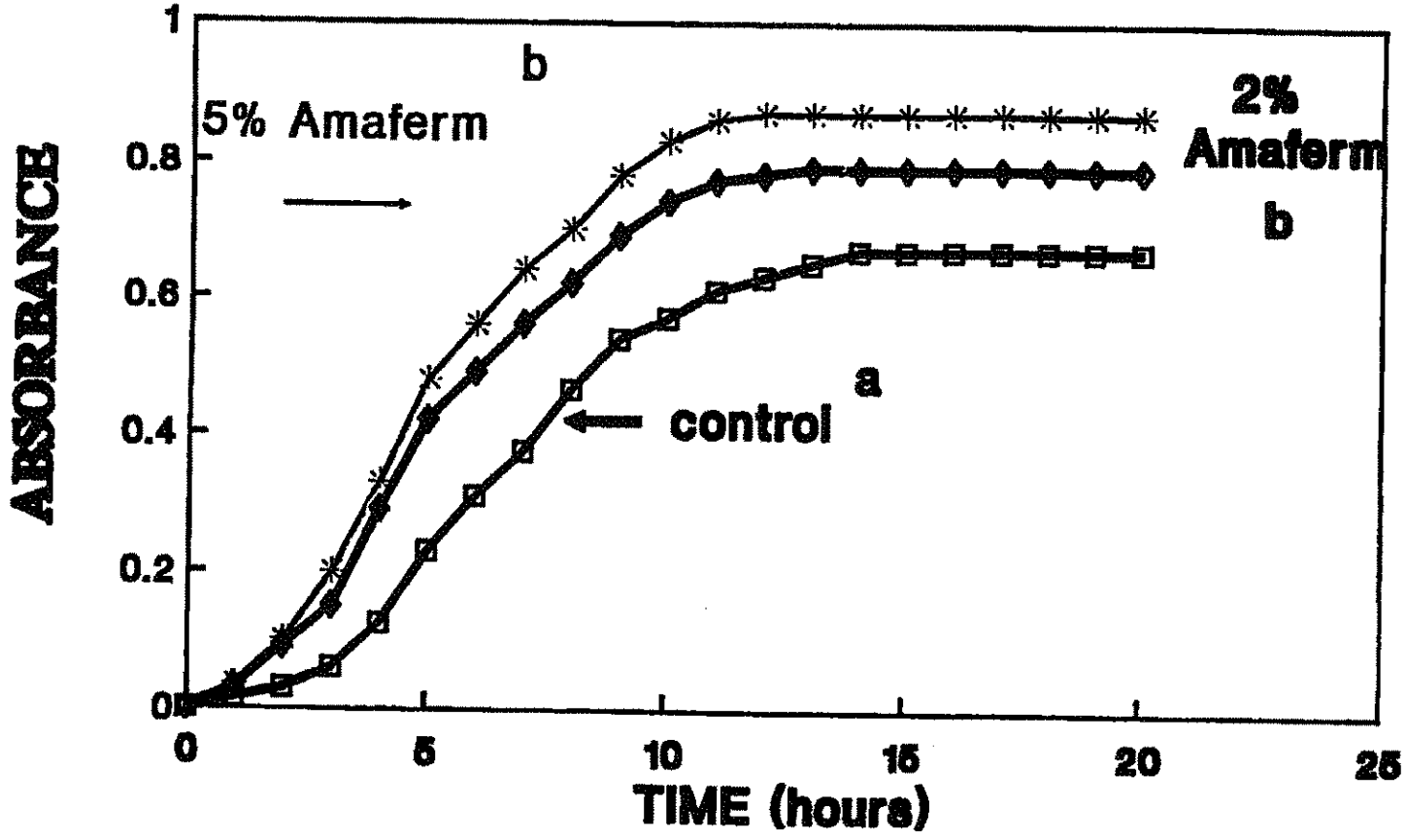
BACTERIAL CULTURE	Effect of Amaferm
Anaerovibrio lipolytica	0
Bacteroides amylophilus	0
Bacteroides (Prevotella) ruminicola	0
Bifidobacterium globosum	0
Butyrivibrio fibrisolvens	0
Eubacterium cellulosolvens	0
Fibrobacter succinogenes	+
Fusobacterium biotype A	0
Fusobacterium biotype B	0
Lachnospira multiparus	0
Lactobacillus vitulinus	0
Lactobacillus ruminis	0
Megasphaera elsdenii	+
Ruminococcus albus	+
Ruminococcus flavefacians	0
Streptococcus bovis	0
Selenomonas ruminantium	+
Veillonella alcalescens	0

Effect Of Amaferm Supplementation On In Vitro NDF Digestion With Antimicrobial Compounds.

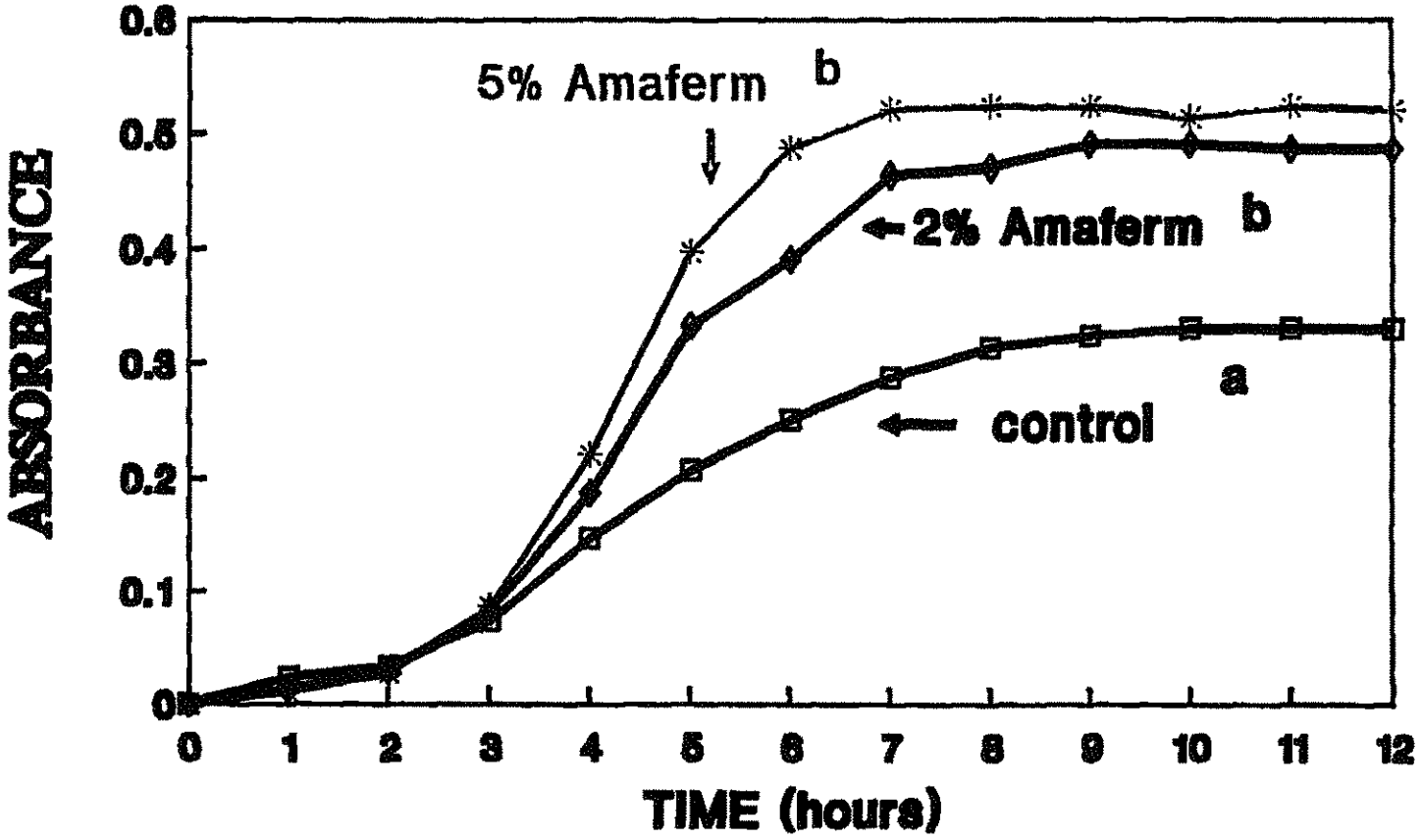
	FEEDSTUFF		
	alfalfa	brome	fescue
% NDF in feedstuff	53.2	69.3	71.0
% NDF digested by:			
1. bacteria + fungi + protozoa (whole rumen fluid, WRF)			
no Amaferm	37.8[a]	55.4[a]	60.0
AO = 1.2 g/l	43.0[b]	61.5[b]	59.0
2. bacteria (WRF + C)			
no Amaferm	32.1[a]	50.8[a]	57.0
AO = 1.2 g/l	39.2[b]	56.3[b]	55.2
3. fungi & protozoa (WRF + penicillin & streptomycin)			
no Amaferm	25.4	30.0	31.8
AO = 1.2 g/l	28.8	27.5	32.4
4. negative control (WRF + P + S + C)			
no Amaferm	3.2	0	0
AO = 1.2 g/l	2.8	3	2.3
5. Amaferm alone (no RF)			
no Amaferm	0	0	0
AO = 1.2 g/l	<1	<1	<1

[ab] Means down a column with different superscripts differ (P<.1).

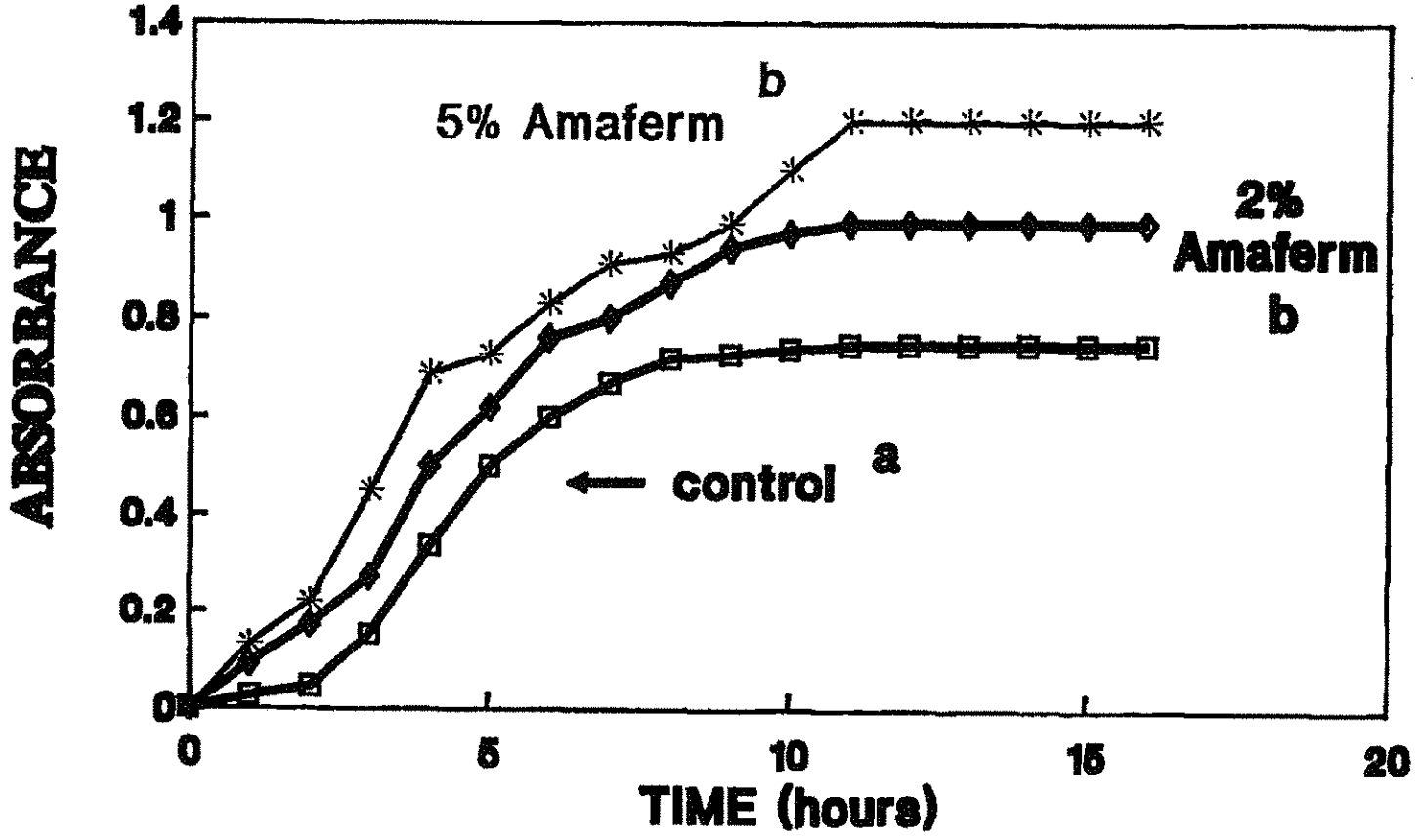
Effect of Amaferm on the specific growth rate of Megasphaera elsdenii. Lines with uncommon superscripts differ (P<.1)



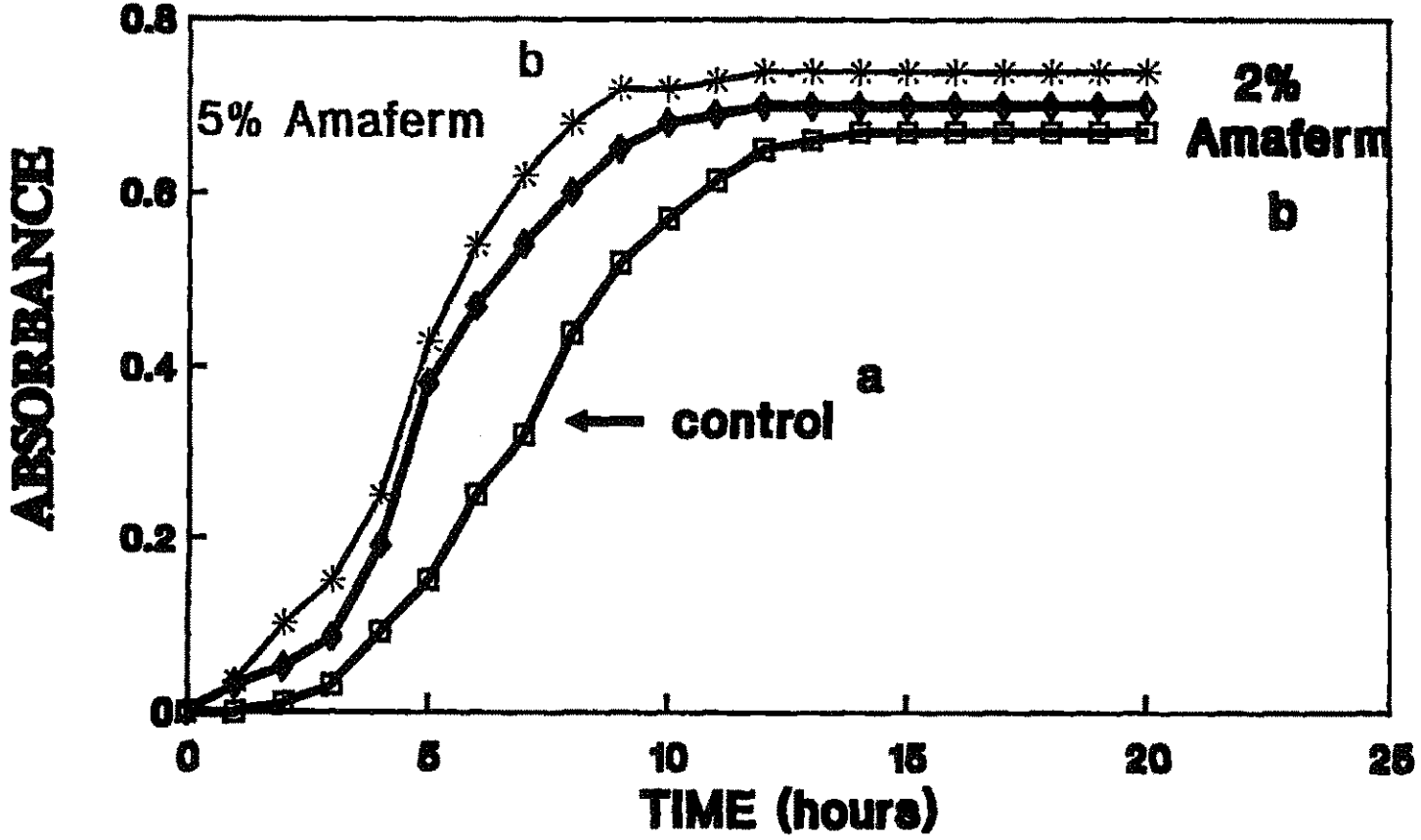
Effect of Amaferm on the specific growth rate of Ruminococcus albus. Lines with uncommon superscripts differ (P<.1).



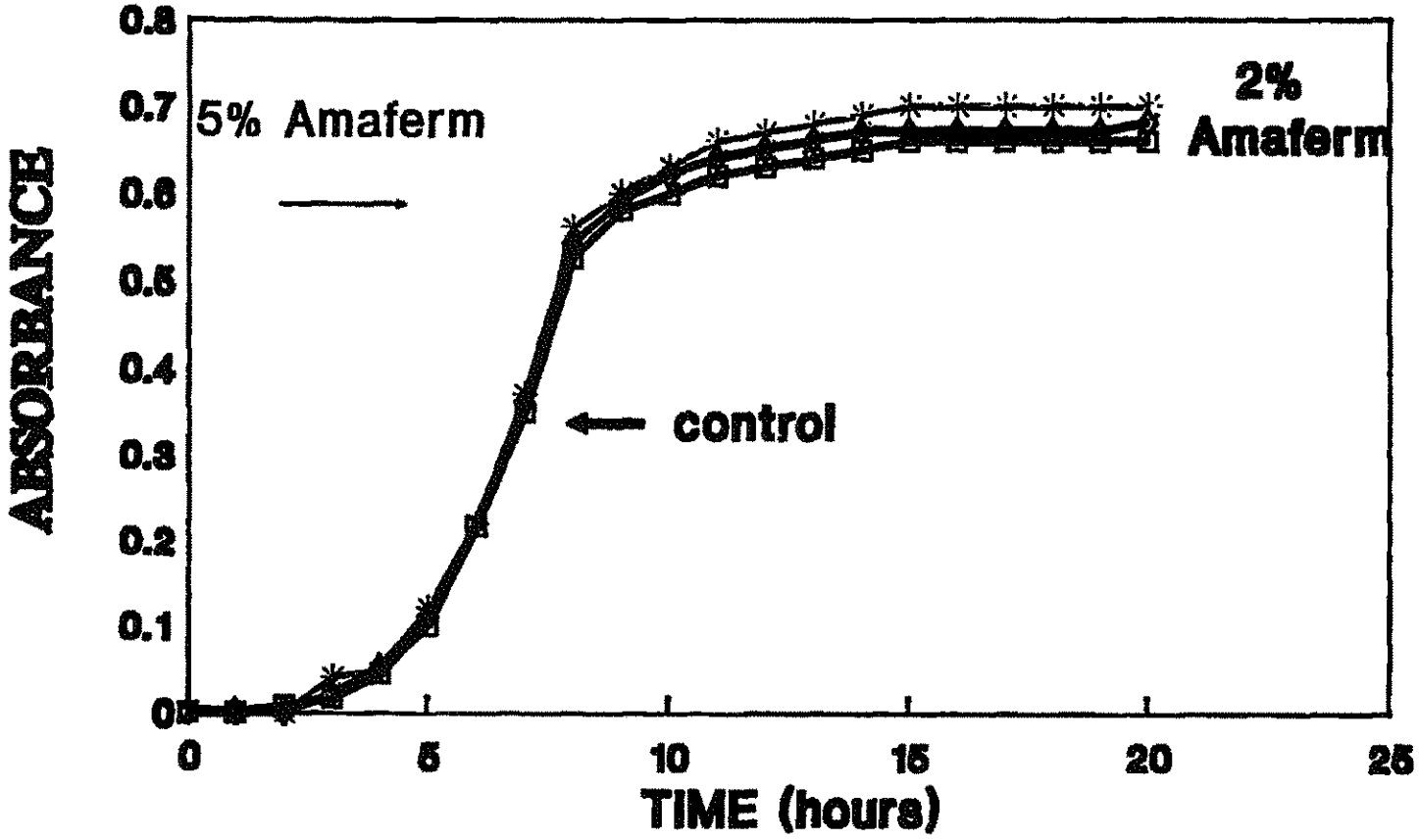
Effect of Amaferm on the specific growth rate of Selenomonas ruminantium. Lines with uncommon superscripts differ (P<.1)



Effect of Amaferm on the specific growth rate of Fibrobacter succinogenes. Lines with uncommon superscripts differ (P< 1)



Effect of Amaferm on the growth rate of Prevotella (Bacteroides) ruminicola. No treatment effect (P>.1).



SUMMARY

1. The addition of Amaferm to the growth medium increased (P<.1) the growth rate of the fibrolytic bacteria *Ruminococcus albus* (.71 vs .61) and *Fibrobacter succinogens* (.35 vs .26).
2. Amaferm had no effect on growth of other fibrolytic bacteria.
3. Additionally, Amaferm supplementation increased the growth rate of *Megasphaera elsdenii* (.44 vs .33) and some strains of *Selenomonas ruminantium* (.77 vs .67).
4. Amaferm increased (P<.1) NDF and ADF digestion of brome and alfalfa hay. Amaferm addition at .4 or .8 g/l and not 1.2 g/l increased NDF and ADF digestion of high endophyte fescue hay.
5. The enhanced fiber degradation by Amaferm was attributed to its stimulation of bacterial activity. Amaferm did not appear to stimulate fungal activity.
6. Addition of Amaferm had no effect on NDF or ADF digestion of pure cellulose, low endophyte fescue hay, wheat straw, corn silage and prairie hay.

In conclusion, Amaferm appears to stimulate NDF and ADF digestibility of only certain feedstuffs, and this increase in digestibility may be a consequence of growth stimulation of some fibrolytic bacteria.