



Evaluation of Rumen Undegradable Protein Sources on Lactational Performance of Holstein Dairy Cows

H. A. Tucker¹, S. M. Fredin¹, H. M. Dann¹, K. W. Cotanch¹, C. S. Ballard¹, L. W. Berghorn², and R. J. Grant¹

¹William H. Miner Agricultural Research Institute, Chazy, NY; ²Afgritech, LLC, Watertown, NY



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INTRODUCTION

Lactating dairy cows require high quality sources of RUP to meet MP requirements. Canola and soybean meal are two RUP sources commonly used in diets for dairy cows. Heat-treating protein sources reduces ruminal degradation of the protein. Furthermore, substitution of protein sources with canola meal has resulted in increased DMI, milk yield, and milk fat and protein yields (Martineau et al., 2013). Heat-treated canola meal may be an improved RUP source compared with other heat-treated feed ingredients such as soybean meal. AminoMax (Afgritech, LLC, Watertown, NY) is a heat-treated blend of canola and soybean meal that may enhance lactational performance of high producing dairy cows compared with heat-treated soybean meal alone.

OBJECTIVE

To measure the effect of heat-treated RUP sources [AminoMax (canola and soybean meal blend) and AminoPlus (soybean meal)] on DMI, milk yield, milk composition, and feed efficiency of Holstein cows

MATERIALS AND METHODS

Experimental Design

- Randomized complete block with 42 multiparous Holstein cows
- Initially, cows averaged (mean ± SE) 146 ± 31 DIM, 866 ± 98 kg of BW, and 2.6 ± 0.7 lactations
- 2-wk covariate period
- 8-wk treatment period
- Treatments were a 1:1 replacement (DM basis) of RUP sources (Table 1 & 2)
 - AminoMax (Afgritech, LLC, Watertown, NY)
 - AminoPlus (Ag Processing, Inc., Omaha, NE)
- Cows were housed in a pen with sand-bedded free-stalls
- Cows fed individually once daily in Calan Broadbent Feeding System (American Calan, Inc., Northwood, NH)
- Cows were milked 3 times daily
- Cows were given rbST (Posilac; Elanco, Greenfield, IN) every 14 d

Data Collection and Analysis

- Feed ingredients and diets collected once per week for nutrient analysis
- Intake and milk yield measured daily
- Milk composition, BW, and BCS measured weekly

Statistical Analysis

- ANOVA tested with the MIXED procedure of SAS
- Covariate was wk 2 data from the covariate period
- Fixed effects were treatment, time, and treatment × time
- Random effect was cow

RESULTS

Table 1. Chemical composition of AminoMax and AminoPlus

Item	AminoMax	AminoPlus
DM, %	84.8 ± 0.3	87.3 ± 0.1
CP, % of DM	<u>41.6 ± 0.3</u>	<u>50.8 ± 0.1</u>
Soluble protein, % of CP	9.3 ± 0.5	5.3 ± 1.2
NDF, % of DM	26.1 ± 1.0	14.5 ± 0.4
Ether extract, % of DM	2.4 ± 0.2	1.3 ± 0.1
Ash, % of DM	9.0 ± 0.2	7.6 ± 0.2
NE _L , Mcal/kg	1.51 ± 0.01	1.84 ± 0.03

Table 2. Ingredient composition of diets during the covariate and treatment periods

Ingredient, % DM	Covariate	Treatment	
		AminoMax	AminoPlus
Conventional corn silage	19.3	19.3	19.3
Brown midrib corn silage	19.3	19.3	19.3
Hay crop silage	14.0	14.0	14.0
Ground corn	10.8	10.8	10.8
Canola meal	7.9	7.9	7.9
AminoMax	3.9	<u>7.7</u>	—
AminoPlus	3.9	—	<u>7.7</u>
Steam-flaked corn	7.6	7.6	7.6
Citrus pulp	6.2	6.2	6.2
Soybean meal	2.7	2.7	2.7
BergaFat ¹	1.4	1.4	1.4
Minerals and vitamins	3.0	3.0	3.0

¹ Berg+Schmidt GmbH & Co., Hamburg, Germany.

Table 3. Chemical composition of diets during the covariate and treatment periods

Item	Covariate	Treatment	
		AminoMax	AminoPlus
DM, %	44.5	44.7 ± 0.5	44.4 ± 0.5
CP, % of DM	15.1	15.6 ± 0.1	15.8 ± 0.2
NDF, % of DM	29.7	31.4 ± 0.1	30.4 ± 0.1
Lignin, % of DM	3.4	3.6 ± 0.1	3.0 ± 0.1
Ether extract, % of DM	4.5	4.4 ± 0.3	4.4 ± 0.2
Ash, % of DM	7.0	7.7 ± 0.1	7.6 ± 0.2
Starch, % of DM	24.8	25.7 ± 0.6	25.0 ± 0.1
Sugar, % of DM	5.8	4.8 ± 0.3	4.6 ± 0.4
NE _L , Mcal/kg	1.68	1.64 ± 0.01	1.69 ± 0.01
24-h NDF digestibility, % of NDF	60.5	58.9 ± 1.8	60.0 ± 0.2
7-h starch digestibility, % of starch	76.0	72.0 ± 2.0	73.5 ± 0.5

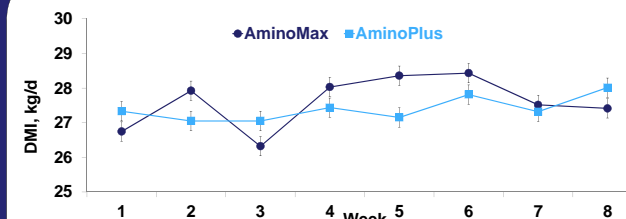


Figure 1. Dry matter intake of cows fed AminoMax (mean = 27.6 kg/d) or AminoPlus (mean = 27.4 kg/d); SE = 0.22; Treatment effect: $P = 0.55$; Wk effect: $P = 0.01$; Treatment × Wk effect: $P = 0.01$.

Table 4. Body weight, BCS, lactational performance, and feed efficiency of cows

Item	Treatment			P-value		
	AminoMax	AminoPlus	SE	Trt	Wk	Trt × Wk
BW, kg	765	752	18	0.61	—	—
BCS	2.9	2.9	0.1	0.88	—	—
Milk, kg/d	43.3	44.7	0.6	0.07	0.01	0.30
SCM, kg/d	43.2	44.4	0.8	0.30	0.01	0.71
Fat, %	4.02	4.03	0.06	0.82	0.01	0.53
Fat, kg/d	1.73	1.78	0.04	0.32	0.01	0.78
True protein, %	3.21	3.18	0.02	0.17	0.01	0.05
True protein, kg/d	1.38	1.40	0.02	0.52	0.01	0.36
Lactose, %	4.73	4.77	0.01	0.05	0.01	0.01
Lactose, kg/d	2.06	2.14	0.03	0.09	0.01	0.87
MUN, mg/dL	9.6	11.4	0.2	0.01	0.01	0.45
Efficiency, kg/kg						
Milk/DMI	1.57	1.63	0.02	0.03	0.01	0.01
SCM/DMI	1.56	1.62	0.02	0.14	0.01	0.08
Milk protein/protein intake	0.324	0.321	0.005	0.69	0.01	0.01

CONCLUSIONS

- In a 1:1 replacement of AminoPlus with AminoMax, SCM, fat, and protein yields were unaffected by dietary treatment.
- Feed efficiency (SCM/DMI) was unaffected by dietary treatment.
- Milk urea-N was decreased for cows fed AminoMax. Coupled with a treatment × wk interaction for improved milk protein content and N efficiency, this suggests improved N utilization for cows fed AminoMax.