

# Evaluation of Rup Content of Nexpro Dried Distillers Grains plus Solubles and Their Effect on Growing Calf Performance in Corn Silage Based Diets

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## Summary with Implications

*A growing study was conducted to evaluate the effect of supplementing NexPro, a high-protein dried distillers grains plus solubles (DDGS) from the FluidQuip MSC post-fermentation separation process, in a corn-silage based diet and to determine the rumen undegradable protein (RUP) content of NexPro. Three test proteins (NexPro, SoyPass, and soybean meal) and 4 inclusion levels (4.5, 9, 13.5, and 18%) were evaluated against a common control (0% test protein). There were no differences in dry matter intake among treatments. Increasing inclusion of NexPro resulted in improved feed conversion and daily gain. SoyPass and soybean meal supplementation also resulted in improved daily gain and feed conversion. Providing additional protein, and specifically rumen undegradable protein, improves cattle performance when fed corn silage growing diets. Performance of steers fed NexPro and SoyPass were similar, which supports NexPro having a similar RUP content.*

## Introduction

Utilization of corn silage allows cattle feeders to harvest the entire corn plant and provide a high quality, yet affordable forage. Corn silage ranges from 6.5 to 8.5% crude protein (CP) with less than 10% of the CP being digestible RUP (2018 Nebraska Beef Report, pp. 52–54). Because of corn silage's low rumen undegradable protein (RUP) content and relatively high energy, supplementation of distillers grains plus solubles (DDGS) will improve calf performance. A

new distillers processing technique (Flint Hills Resources, Wichita, KS) is producing high-protein DDGS, termed NexPro, with a crude protein content of 52% (dry matter [DM] basis). Traditional DDGS range from 30–34% crude protein with 63% of that being RUP. Therefore, our objective was to determine the effects of supplementing NexPro in corn silage-based diets on growing calf performance, and the RUP content of NexPro based on performance by comparison to SoyPass and conventional soybean meal, which are similar in CP to NexPro.

## Procedure

An 84 d growing study was conducted at the University of Nebraska feedlot near Mead, NE using 120 crossbred steers (initial BW = 551 ± 53 lb). All steers were individually fed using the Calan gate system. Steers were limit fed a diet consisting of 50% alfalfa hay and 50% Sweet Bran for five days prior to trial initiation at 2% of BW to reduce gut fill variation. Steers were weighed 3 consecutive days (d -3, d -2, and d -1) to establish average initial BW. Steers were stratified by d -3 and d -2 BW and assigned randomly to one of 13 treatments. Treatments were arranged in a 3 × 4 + 1 factorial with test protein (NexPro, SoyPass, soybean meal) and inclusion (4.5%, 9.0%, 13.5%, 18.0% of diet DM) being the factors, plus a shared control with 0% test protein. Steers were implanted on d -1 with Ralgro and fed ad-libitum once daily. Feed refusals were collected weekly, weighed, and dried in a 60° C forced air oven for 48 hours to calculate accurate DMI for individual steers. At conclusion of the study, steers were offered the same limit fed diet at 2% of BW for 5 days to minimize variation in gut fill. Ending BW was calculated as the average of weights collected on 3 consecutive days after the conclusion of the limit feeding period. Treatment diets are presented in Table 1. The diets consisted of 80% corn silage with the remaining 20% being fed as either

RDP or test protein supplement. Both supplements contained minerals, vitamins A-D-E and a finely-ground corn carrier. Test proteins were used to provide supplemental RUP and included NexPro (51.4% CP, 50% RUP as % of CP), SoyPass (48.8% CP, 74% RUP as % of CP) as a positive control, and conventional soybean meal (52.4% CP, 22% RUP as % of CP) as a negative control. Samples of test proteins utilized in the cattle performance study were analyzed for CP and RUP content using an *in situ* process. SoyPass is a non-enzymatically browned soybean meal. Four levels of supplementation were evaluated with 8 steers per inclusion of test protein with a common control represented by 24 steers.

Data were analyzed using the GLIMMIX procedure of SAS as a randomized design. Steer was the experimental unit. Orthogonal contrasts were used to analyze linear and quadratic effects of inclusion of each test protein. Slopes of the response to inclusion of test protein were determined using the regression procedure of SAS and slopes were compared using the GLM procedure of SAS. Treatment means were compared when the F-test statistic for treatment was significant. Significance was declared at  $P \leq 0.05$  and tendencies at  $P \leq 0.10$ .

## Results

Performance results for NexPro, SoyPass, and soybean meal are presented in Tables 2, 3 and 4, respectively. There were no interactions observed for DMI (dry matter intake), ADG (average daily gain), or feed conversion among type of protein supplementation and inclusion level ( $P \geq 0.29$ ). There were no differences in DMI ( $P \geq 0.15$ ) among treatments. Steers supplemented with NexPro had a quadratic ( $P = 0.01$ ) increase in ADG. NexPro steers had a linear ( $P < 0.01$ ) improvement in F:G. SoyPass supplemented steers had a linear ( $P < 0.01$ ) increase in ADG and a linear ( $P < 0.01$ ) improvement in F:G. Supplementation of soybean meal resulted in a quadratic ( $P =$

**Table 1. Diet composition (% of diet DM) of growing diets individually fed to steers for 84 d**

Ingredient, %	Treatment <sup>1</sup>				
	0.0%	4.5%	9.0%	13.5%	18.0%
Corn Silage	80.0	80.0	80.0	80.0	80.0
RDP Supplement <sup>2</sup>	20.0	15.0	10.0	5.0	-
Test Protein Supplement <sup>3</sup>	-	5.0	10.0	15.0	20.0

<sup>1</sup> Treatments: Diets contained 80% corn silage and were formulated to contain 0, 4.5, 9.0, 13.5 or 18.0 % test protein. Test Proteins included soybean meal, SoyPass, or NexPro

<sup>2</sup> RDP supplement formulated for a target inclusion of 20% total diet DM and contained 81.45% fine ground corn, 8.55% urea, 5.60% limestone, 2.50% tallow, 1.50% salt, 0.25% trace minerals, 0.075% vitamin A-D-E. Formulated to provide 200 mg/steer daily Rumensin (Elanco Animal Health)

<sup>3</sup> RUP supplement formulated for a target inclusion of 20% total diet DM and contained 90.0% test protein, 5.60% limestone, 2.50% tallow, 1.50% salt, 0.25% trace minerals, 0.075% vitamin A-D-E. Formulated to provide 200 mg/steer daily of Rumensin (Elanco Animal Health)

**Table 2. Performance of growing steers fed a corn silage-based diet supplemented NexPro at 0.0, 4.5, 9.0, 13.5, or 18.0% DM inclusion**

	Inclusion, %					SEM	F-test	P-values	
	0.0	4.5	9.0	13.5	18.0			Lin.	Quad
<i>Performance</i>									
Initial BW, lb	554	548	549	547	559	19.7	0.99	0.85	0.59
Final BW, lb	703 <sup>b</sup>	747 <sup>ab</sup>	741 <sup>ab</sup>	791 <sup>a</sup>	772 <sup>a</sup>	22.1	0.08	<0.01	0.35
DMI, lb/d	15.5	16.6	16.1	17.1	16.6	0.75	0.15	0.19	0.52
ADG, lb	1.78 <sup>c</sup>	2.37 <sup>b</sup>	2.29 <sup>b</sup>	2.91 <sup>a</sup>	2.53 <sup>ab</sup>	0.15	<0.01	<0.01	0.01
Feed:Gain	8.74 <sup>b</sup>	6.94 <sup>a</sup>	7.08 <sup>a</sup>	5.86 <sup>a</sup>	6.49 <sup>a</sup>	-	<0.01	<0.01	0.11

<sup>a,b,c</sup> means with different superscripts within a row differ ( $P < 0.05$ ). Superscripts can be compared between tables.

**Table 3. Performance of growing steers fed a corn silage-based diet supplemented SoyPass at 0.0, 4.5, 9.0, 13.5, or 18.0% DM inclusion**

	Inclusion, %					SEM	F-test	P-values	
	0.0	4.5	9.0	13.5	18.0			Lin.	Quad
<i>Performance</i>									
Initial BW, lb	554	553	545	544	549	19.7	0.99	0.71	0.80
Final BW, lb	703 <sup>b</sup>	745 <sup>ab</sup>	748 <sup>ab</sup>	743 <sup>ab</sup>	782 <sup>a</sup>	22.1	0.08	0.01	0.86
DMI, lb/d	15.5	17.5	17.8	14.8	16.7	0.75	0.15	0.84	0.18
ADG, lb	1.78 <sup>c</sup>	2.28 <sup>b</sup>	2.42 <sup>ab</sup>	2.36 <sup>b</sup>	2.78 <sup>a</sup>	0.15	<0.01	<0.01	0.45
Feed:Gain	8.74 <sup>b</sup>	7.49 <sup>b</sup>	7.37 <sup>b</sup>	5.94 <sup>a</sup>	5.84 <sup>a</sup>	-	<0.01	<0.01	0.97

<sup>a,b,c</sup> means with different superscripts within a row differ ( $P < 0.05$ ). Superscripts can be compared between tables.

**Table 4. Performance of growing steers fed a corn silage-based diet supplemented soybean meal at 0.0, 4.5, 9.0, 13.5, or 18.0% DM inclusion**

	Inclusion, %					SEM	F-test	P-values	
	0.0	4.5	9.0	13.5	18.0			Lin.	Quad
<i>Performance</i>									
Initial BW, lb	554	554	550	544	560	19.7	0.99	0.66	0.66
Final BW, lb	703 <sup>b</sup>	737 <sup>ab</sup>	755 <sup>a</sup>	752 <sup>ab</sup>	758 <sup>a</sup>	22.1	0.08	0.04	0.30
DMI, lb/d	15.5	16.4	17.4	16.3	15.9	0.75	0.15	0.78	0.07
ADG, lb	1.78 <sup>c</sup>	2.18 <sup>b</sup>	2.44 <sup>b</sup>	2.49 <sup>b</sup>	2.36 <sup>b</sup>	0.15	<0.01	<0.01	0.01
Feed:Gain	8.74 <sup>b</sup>	7.45 <sup>ab</sup>	7.10 <sup>a</sup>	6.44 <sup>a</sup>	6.75 <sup>a</sup>	-	<0.01	<0.01	0.21

<sup>a,b,c</sup> means with different superscripts within a row differ ( $P < 0.05$ ). Superscripts can be compared between tables.

0.01) increase in ADG. Steers supplemented with soybean meal also had a linear ( $P < 0.01$ ) improvement in F:G. Using regression analysis there were no differences ( $P \geq 0.13$ ) between SoyPass, NexPro, and Soybean meal slopes as ADG or feed efficiency increased in response to increased inclusion of the test proteins.

Supplementation at the highest inclusion of NexPro showed a 42% increase in ADG over the control while the SoyPass supplemented steers showed a 56% increase in ADG. Feed conversion of the NexPro and SoyPass supplemented steers improved 26 and 33%, respectively, over the control fed steers. Soybean meal supplementation resulted in improvements to ADG and F:G

by 32 and 23%, respectively. Increasing the inclusion of NexPro resulted in a metabolizable protein (MP) balance of -231 to +114 g/d. NexPro included at 9% of the diet had a -60 g/d balance while the MP balance at 13.5% was +24 g/d. This could explain the quadratic response for daily gain with high inclusions of NexPro as daily gains and F:G are similar from 13.5 to 18% inclusion.

### Conclusion

Supplementation of protein in corn-silage based diets resulted in increased final BW, ADG, and improved feed conversion. Use of NexPro and SoyPass resulted in greater improvements than the use of

soybean meal, confirming that they have a greater RUP content. Performance of steers fed NexPro and SoyPass were similar, which supports NexPro having a similar RUP content.

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