ANNUAL REPORT
COMPREHENSIVE RESEARCH ON RICE
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PROJECT TITLE: The influence of processing on the comparative feeding value of rice straw in diets for feedlot cattle.

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OBJECTIVES AND EXPERIMENTS CONDUCTED BY LOCATION TO ACCOMPLISH

OBJECTIVES:

1) *In vitro* experiments to determine degree of maceration effect

2) Feedlot growth-performance trials to evaluate the influence of maceration and fibrolytic enzyme supplementation on comparative feeding value of rice straw.

- Cattle fed 15% forage finishing diet
- Cattle fed 10% forage growing-finishing diet

3) Feedlot growth-performance trials to evaluate influence of pelletizing on comparative feeding value of rice straw

SUMMARY OF 2002 RESEARCH (MAJOR ACCOMPLISHMENTS) BY OBJECTIVE:

1)A series of in vitro experiments were conducted to evaluate the influence of macerator roller-speed differential and ram pressure on rate of rice straw fiber digestion. The macerator process was optimized (rate of digestion increased 28%) with a roller speed differential of 18:13 rpm and a ram pressure of 600 psi.

2)*Trial 1.* Ninety Holstein steers weighing 468 kg were blocked by weight into to 18 pens (5 steers/pen) in a 116-d comparative slaughter study. Treatment consisted of steam-flaked corn-based finishing diet containing 15% forage as sudangrass, rice straw, or macerated rice straw

supplemented with either 0 or 15g/d of Fibrozyme (Alltech, Inc.). Forages were ground to pass through a 2.6 cm screen prior to incorporation into complete mixed diets. Treatments were arranged as a 3 x 2 factorial. Preliminary results of Trial 1 are shown in Table 1.

Trial 2. One hundred eight Holstein calves were blocked by weight and randomly assigned within weight groupings to 18 pens (6 steers/pen)in a 241 d comparative slaughter study. Treatments are the same as in Trial 1 except that forage level was reduced to 10%. This experiment is still in progress.

Trial 3. Seventy-two yearling crossbred steers were used in a 125-d finishing trial to evaluate the influence of pelletizing on the feeding value of rice straw. Steers were balanced by weight and randomly assigned to 18 pens (4 steers/pen). Treatments consisted of a steam-flaked corn-based diet containing 12% sudangrass, 12% pelletized rice straw or 24% pelletized rice straw. Sudangrass hay was ground to pass through a 2.6 cm screen prior to incorporation into complete mixed diets.

Trial 4. Ninety crossbred steers (349 kg) were used in a 116-d finishing trial to evaluate the influence of pelletizing on the feeding value of rice straw. Steers were balanced by weight and assigned to 18 pens (5 steers/pen). Experimental diets containd 12% forage as sudangrass hay, rice straw, or pelletized rice straw. The sudangrass hay and nonpelletized rice straw were ground to pass through a 2.6 cm screen prior to incorporation into complete mixed diets.

PUBLICATIONS OR REPORTS:

López-Soto, M.A., A. Plascencia, G.E. Arellano, and R.A. Zinn. 2000. Interaction of maceration and fibrolytic enzyme supplementation on the site and extent of digestion in rice straw in holstein cows. Proc. West. Sect. Am. Soc. Anim. Sci. 51:458-462.

N. Torrentera, E. G. Alvarez, and R. A. Zinn. 2000. Influence of maceration on the feeding value of rice straw in growing-finishing diets for feedlot cattle. Proc. West. Sect. Am. Soc. Anim. Sci. 51: 496-499.

R. A. Ware, E. G. Alvarez, M. Machado, M. F. Montaño, S. Rodriquez, and R. A. Zinn. 2002. Influence of pelletizing on the feeding value of rice straw in growing-finishing diets for feedlot cattle. Western Section Vol, 53, 2002

CONCISE GENERAL SUMMARY OF CURRENT YEAR'S RESULTS:

Maceration: Maceration greatly enhanced the feeding value of rice straw by creating greater surface area and points of entry for fibrolytic bacteria. Given that the net energy value of sudangrass was 1.18 and .61 for maintenance and gain, respectively (NRC, 1996), then the corresponding net energy values for nonmacerated rice straw are .95 and .42 Mcal/kg, respectively, and for macerated rice straw the values are 1.51 and .92 Mcal/kg. The comparative

NE values obtained for nonmacerated rice straw are appreciably greater than the published tabular values (.61 and .11 Mcal/kg, respectively; NRC, 1984). Maceration increased the NE values of straw for maintenance and gain by 59 and 119, respectively! Additionally, the combination of fibrolytic enzyme supplementation and maceration permitted greater energy intake and hence, daily weight gain. This is latter effect was apparently due to an increased rate of ruminal turnover. Enzyme supplementation did not appear to have a direct effect on the NE value of the diet.

Pelletizing:

Trial 3. There were no treatment effects daily weight gain. However, at the 12% forage level, DMI, gain efficiency and dietary NE were similar for sudangrass and pelletized rice straw. Increasing the inclusion rate of pelletized rice straw from 12 to 24% increased (11%) DMI, and decreased gain efficiency, and dietary NE for maintenance and gain (5 and 6%, respectively). Three steers with cannulas in the rumen and proximal duodenum were used in a 3 x 3 Latin square experiment evaluate treatment effects on digestion. There were no treatment effects on ruminal digestion of OM, NDF, and feed N. Ruminal starch digestion was similar for 12% sudangrass and pelletized rice straw, but increased (5%) with 24% pelletized rice straw. Total tract digestion of OM and DE were also similar for 12% sudangrass and pelletized rice straw, but decreased (5 and 6%, respectively) with 24% PRS. There were no treatment effects on total tract digestion of fiber (NDF), N, and starch. At lower inclusion rates (12% forage level), the NEm and NEg values of pelletized rice straw are equivalent to sudangrass hay (1.18 and .61 Mcal/kg, respectively). At higher forage levels (24%), the NEm and NEg values of pelletized rice straw are greatly enhanced (1.46 and .87 Mcal/kg, respectively).

Trial 4. The laboratory analysis and data summaries for the growth-performance and metabolism trials should be completed with the next three weeks.

Table 1. Treatment effects on feedlot cattle growth performance (Preliminary).

	Fibrozyme®, g/d						
	0			15			
Item	Sudan	RSG	RSM	Sudan	RSG	RSM	SD
Pen Replicates	5	5	5	5	5	5	
Weight, kg							
IW	467	469	467	465	468	466	
FW	606	604	603	598	603	609	
DM Intake, kg/d							
d 1-116[a]	9.06	9.23	8.76	8.95	9.15	9.20	.29
Avg Daily Gain, kg/d							
d 1-116[a]	1.19	1.17	1.17	1.14	1.17	1.23	.05
Feed/Gain							
d 1-116[b]	7.61	7.90	7.47	7.83	7.84	7.46	.29
Yield Grade[cde]	2.80	2.71	2.54	3.36	2.63	3.33	.22
Quality Grade[e]	5.94	6.28	4.80	5.61	3.17	6.33	1.32
Fat Thickness, cm[ef]	.81	.76	.66	1.05	.67	.93	.12
Dressing percentage, %	61.7	62.5	62.1	62.6	62.1	62.0	.9
Diet net energy, Mcal/kg							
Maintenance[b]	2.25	2.19	2.30	2.22	2.21	2.27	.06
Gain[b]	1.57	1.51	1.61	1.54	1.53	1.58	.05
Observed/Expected Net Energy							
Maintenance	1.02	1.04	1.09	1.01	1.04	1.07	.03
Gain	1.03	1.05	1.11	1.01	1.05	1.09	.04

[a] Forage x Enzyme Interaction, (P<.10)
[b] Effect of Maceration, (P<.05)
[c] Effect of Enzyme, (P<.01)
[d] Effect of Maceration, (P<.10)
[e] Forage x Enzyme Interaction, (P<.01)
[f] Effect of Enzyme, (P<.05)