PROJECT NO. RU-5

ANNUAL REPORT
COMPREHENSIVE RESEARCH ON RICE
January 1, 2012 - December 31, 2012

PROJECT TITLE: **Dairy Feeding of Rice Hay**

STATUS OF PROPOSAL: ____/New x /Continuing

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LEVEL OF 2O12 FUNDING: $21,950

OBJECTIVES AND EXPERIMENTS CONDUCTED:

***Objective 1 –Comparison of Rice and Wheat Straw* in Dairy Heifer Rations**
A study was conducted to compare effects of 18% dietary dry matter (DM) inclusion of rice straw (RS) or wheat straw (WS) on Holstein heifer (400 to 500 pounds) on dry matter intake, digestibility, body condition score (BCS) and growth.

Objective 2 –Improve Digestibility of Rice Straw
Study the reasons that rice straw is hydrophobic as the water that permeates the tissue provides the avenue through which the rumen microbe enzymes reach their targets.

Identify the factors that limit the ability of rumen microbes to digest the cellulose and other polysaccharides in rice straw and identify strategies that could reduce the negative effects of these factors.

SUMMARY OF 2012 RESEARCH:

***Objective 1 –Comparison of Rice and Wheat Straw* in Dairy Heifer Rations**
Four pens of 120 heifers were randomly assigned to rice or wheat straw at the same percent of the ration. The ration consisted of the following:

Premix	0.7
Grape Pomace	7.6
Tomato Pomace	7.8
Ko-Pro	8.6

Pushout	9.7
Canola Meal	11
Straw (Wheat or Rice)	17.5
Wheat Silage	37.1

Two pens were fed either rice or wheat straw for 28 days. The next 28 days all four pens were fed wheat straw to determine any compensatory gains from switching from rice to wheat straw as compared to pens fed straight wheat straw. Hip height, hip width, and body scores were recorded on Day 0, Day 28 and Day 56.

The findings of the study were that there was no difference in DM intake (RS 15.8 vs. WS 16.46 lbs./head/day). The hip height which measures skeletal growth was also not different with any of the straw treatment. The groups also had no difference in hip height during the second 28 when all were on wheat straw. Hip width was different in the first 28 days (RS 37.8 WS 37.9). When fed wheat straw during the second 28 day period the rice straw pens demonstrated compensatory gain in hip width and had no difference to the wheat straw group. The same findings occurred with the Body Condition Score (BCS). During the first 28 day period there was a difference between rice and wheat straw fed heifers (RS 3.66 WS 3.74), but when fed wheat straw during the second period there was no difference. This demonstrates that the energy difference in the two straws can be quickly erased by a short feeding of higher energy ration. A combined formula of tailhead height and hip width to create a 2-dimensional measure of skeletal growth, termed heifer frame score (HFS) was not different at any point in the trial.

Analysis for fecal digestibility and a nutrient profile of the total mixed ration have not been received from the laboratory at the time of this report. Once this data is obtained a difference in energy levels of the straw can be determined and then a relative energy value can be assigned to each straw for pricing.

Objective 2 –Improve Digestibility of Rice Straw

The project is just starting and there are no results to report at this time. Further discussions between the researchers have further refined the work that will be conducted this winter and spring. The studies will address two issues: 1) Hydrophobic nature of rice straw and 2) Improvement of straw polysaccharide digestion in the rumen. Water that permeates the tissue provides the avenue through which the rumen microbe enzymes reach their targets. When rice is growing its cell wall "space" contains a lot of water, but this is lost during the harvesting and storage of the straw. Re-hydrating the straw, when it occurs, takes a long time. This probably explains why digestion of rice straw in the rumen takes a particularly long time. Drying of the straw may affect the ability of rumen microbes to digest straw polysaccharides. A preliminary experiment (not highly replicated) involved testing the impact of an ethanol "pre-wetting" of straw samples (often used to enhance enzyme action on cell wall substrates) on the ability of a bacterial xylanase enzyme to digest rice straw polysaccharides. Xylanase digests xylan, an important rice straw polysaccharide; it was used in an effort to understand factors that might limit enzyme access to rice cell wall polymers. The enzyme's digestion action was greater following the ethanol treatment, a result that supports our plan to focus some attention on the possibility that the rice plant's surface water-repelling cutin layer may be a contributor to the difficulty in getting the straw efficiently digested.

PUBLICATIONS OR REPORTS

It's not the silica level in rice straw which causes its low digestibility by cattle. G.S. Cun, G.A. Nader, P.H. Robinson. *Poster at the 2012 California Animal Nutrition Conference.*

Nader, G.A., G.S. Cun, P.H. Robinson. 2012. **Impacts of silica levels, and location in the detergent fiber matrix on in vitro gas production of rice straw.** *Animal Feed Science and Technology 174 (2012) 140– 147*

CONCISE GENERAL SUMMARY OF CURRENT YEAR′S RESULTS

***Objective 1 –Comparison of Rice and Wheat Straw* in Dairy Heifer Rations**
The project again demonstrated that rice straw supplies a lower energy level to the diet than wheat straw. Once the laboratory analysis is competed a relative energy value can be assigned. Thus, if for example rice straw has 95% of the energy level of wheat straw that is priced at $100/ton, then growers should be able to ask $95/ton for rice straw. The other finding was that dairy producers could use rice straw for short feed periods and no impact skeleton growth of heifers. This could be used in a stair step feeding program to save on feed costs and then supply more energy to achieve compensatory gains and the targeted body condition score.

Objective 2 –Improve Digestibility of Rice Straw
The researcher's field experience has identified that the major difference with rice straw is its hydrophobic nature. It is postulated that the enzymes that break down the straw are limited by the time it takes in the rumen for the straw to hydrate before digestion.