



***NIRS Forage & Feed Testing  
Consortium***

***Calibration Committee***

Chuck Kahl – Chair

Paul Vendrell      Dan Undersander

Steve Fransen      Sam Stratton

Dennis Walker      Paul Martin

Patty Laskowski      Jeff Boedigheimer



***NIRS Forage & Feed Testing  
Consortium***

***Calibration Committee***

**Starch in Fermented  
Corn Silage**



## ***NIRSC Forage & Feed Testing Consortium Calibration Committee***

### **2001-2002:**

NIRSC members had begun to show interest

### **2003:**

Attendees of the NIRSC annual conference agreed to pursue an NIRSC starch equation

- Sample exchange/check to assess the various reference methods under direction of Mary Beth Hall (14 labs participated using their usual methods)
- Mary Beth prepared a report, sent to all of NIRSC in Oct 2003.
- NIRSC questioned whether to use spectra and chemical data from labs that performed well (multiple methods) or wait for Mary Beth's recommendation on a single reference method.



## ***NIRSC Forage & Feed Testing Consortium Calibration Committee***

### **2004 annual conference**

**Mary Beth reported on the check test of 2003(See NIRSC website), stating the goal was**

- "To evaluate the ability of labs to analyze accurately for starch and "sugars"
- Assess variability among labs
- Seek ways to improve accuracy."

### **Recommendations from Mary Beth's report included:**

- Run the complete assay from start to finish ASAP
- Use an analysis that is specific for glucose
- Use glucose as the standard for the assay
- Check enzyme specificity on sucrose
- Include a starch control & reagent blank in each run
- Remove interfering substances
- Account for free glucose



## ***NIRS Forage & Feed Testing Consortium***

### ***Calibration Committee***

#### **2005:**

2005 annual conference Mary Beth related an update and a continuation on her evaluation of starch methods, noting a search for consensus and a literature review.

In July of 2005, Mary Beth reported that she had “been working on both a review of literature, analytical work, and contacting other carbohydrate analysts to make most rapid progress on factors that affect starch analysis.”

The take home message was that in the analysis of starch, there was yet no consensus on methodology that NIRSC could use as a recommendation to choose a reference method to begin developing a starch equation.



## ***NIRS Forage & Feed Testing Consortium***

### ***Calibration Committee***

#### **2006:**

**At the 2006 annual conference Mary Beth covered**

- analysis issues that labs encounter
- Reviewed and evaluated the types of starch analyses
- Mentioned a method she felt promising (Bach Knudsen, 1997)
- Take home message - there may be more than one acceptable analysis method if the results are accurate and represent true starch recovery.



## ***NIRS Forage & Feed Testing Consortium Calibration Committee***

### **October 2006 –**

Calibration Committee evaluated original work done with the starch check test in 2003. Common methods used - YSI and MBH's method. Acceptable reference method chosen and five reference standard samples collected for purpose of blind evaluation of the four labs invited to bid for job.

- Spectra solicited from NIRSC labs for sample selection.
- Nine labs sent in spectra from both MW and oven dried samples.
- The NIRSC board decided to include both drying methods
- 130 samples selected and scanned on NIRSC master instrument.
- Results from bidding labs returned November/December, 2006.



## ***NIRS Forage & Feed Testing Consortium Calibration Committee***

### **August 2007**

NIRSC calibration committee selected AgSource Cooperative as the reference lab based on:

- Accuracy of results of the standards test
- Ability to meet a turnaround time and cost

Samples sent to lab for analysis in September, 2007

Analysis was completed in December of 2007 and data sent to Paolo. DAS/Mycogen supported the development of this equation with "seed" money of \$2000.

First version released December 2007 at no charge to those who signed up during trial period. Next sign-up the annual fee for the starch equation will be charged.

To date 7 NIRSC members have received the equation.



## *NIRS Forage & Feed Testing Consortium*

### *Calibration Committee*

**For 2008**, this starch equation will be added to the corn silage TDN package of equations. A separate line for starch on the equations sign-up and fee sheet will be added and an annual fee for the starch will be determined by the NIRSC Board.

The equation is based on a limited data set of 100 samples. This must be considered a starting point a more work (sample and analysis) is needed to make this equation stable, robust and very accurate. Nevertheless the data set embrace a large variability with a standard deviation of 10.

Constituent	N	Mean	SD	SEC	RSQ	SECV	1-VR
starch	97	24.73	10.00	1.83	0.97	2.26	0.95



## *NIRS Forage & Feed Testing Consortium*

### *Calibration Committee*

# Sugar Equation



***NIRS Forage & Feed Testing  
Consortium  
Calibration Committee***

**2006:**

Interest from NIRSC members led the Calibration committee to explore development

Mixed hay and grass hay are common products analysed for sugar. Common wet chemical methods include a modified hydrolysis and YSI.

One possibility was to find labs that run sugars, receive the spectra and chemistry data, and create a calibration.

The question of accuracy of method was raised here, since there is no one standard sugar method.



***NIRS Forage & Feed Testing  
Consortium  
Calibration Committee***

**2006 continued:**

Mary Beth Hall previewed sugar analysis in several of her NIRSC annual conference starch presentations, especially 2006. She noted, “Define “sugars”, and we can choose an analysis. To define sugars, we need to know what matters to the animal.”



***NIRS Forage & Feed Testing  
Consortium  
Calibration Committee***

**2007:**

Of interest in area of warm and cool season grasses are water soluble carbohydrates to seed breeders and fructose, fructosans, and glucose to horse nutritionists. Dr. Kevin B. Jensen of Forage and Range Research Lab, Utah State University in Logan, UT is assisting us with this equation.



***NIRS Forage & Feed Testing  
Consortium  
Calibration Committee***

**November 2007**

NIRSC standardized Dr Jensen's instrument and he provided their sugar equation.

Sam Stratton sent spectra in and Paolo selected 50 samples to add to Logan lab's equation.

Data is to be entered into NIRSC database on selected samples, and then samples will be requested.

The Logan lab will then run the samples and we will add them to the donated equation.

A sugar equation in fermented corn silage is of interest as well.

This would be a different equation than that described for grasses.



***NIRS Forage & Feed Testing  
Consortium  
Plant Breeders Committee***

Chuck Kahl	Paolo Berzaghi
David Johnson	Neal Martin
Sam Stratten	Dan Undersander
Dave Whalen	Dennis Walker
Paul Williams	Patty Laskowski
David Sevenich	Steve Fransen
Bill Mahanna	Others



***NIRS Forage & Feed Testing  
Consortium  
Plant Breeders Committee***

- Equations currently used for breeding purposes:
  - Alfalfa Breeders
  - Corn Silage Unfermented and/or Fermented
  - Grass Hay
- Most select and promote germplasm with less lignin
  - Corn silage
  - Sudangrass
  - Teff Grass
  - Alfalfa
- Cool & Warm season grasses for sugars
  - water soluble carbohydrates to seed breeders
  - fructose, fructosans, and glucose to horse nutritionists
- Fermented corn silage
  - sugar





## *NIRS Forage & Feed Testing Consortium*

### *Plant Breeders Committee*

#### **Alfalfa Breeder's Equation History**

- The original equation was initiated by ABI Alfalfa;
- Cal West Seeds, FFR Cooperative, Forage Genetics, Pioneer HiBred, and Dairyland Seed joined later
- ABI was bought by Forage Genetics and Dairyland Seed discontinued NIRSC membership, leaving 4 seed research companies in the alfalfa breeders group
- Equation for predicting oven dried, green cut research plot alfalfa samples
- Wiley Mill ground to pass through a 2mm screen or cyclone mill ground to pass through a 1mm screen



## *NIRS Forage & Feed Testing Consortium*

### *Plant Breeders Committee*

Year	Analyses/Parameters	# Samples	Total Cost	Cost/Member
1999	DM, CP, ADF, NDF, IVDDM, ADL, P, Ca, K, Mg	~34	\$2,761.99	\$460.33
2000	DM, CP, ADF, NDF, IVDDM, ADL, P, Ca, K, Mg	94	\$7,725.00	\$1,287.50
2000RUP	RUP	79	\$3,555.00	\$592.50
2001	DM, CP, ADF, NDF, IVDDM, ADL, P, Ca, K, Mg	59	\$5,658.00	\$943.00
2001dNDF	dNDF	75	\$6,000.00	\$1,000.00
2002	DM, CP, ADF, NDF, IVDDM, ADL, P, Ca, K, Mg	48	\$4,462.00	\$744.00
2003	DM, CP, ADF, NDF, IVDDM, ADL, P, Ca, K, Mg, dNDF	180	\$15,805.20	\$2,634.20
2004	DM, CP, ADF, NDF, IVDDM, ADL, P, Ca, K, Mg, dNDF	127	\$11,654.40	\$1,942.40
2005	DM, CP, ADF, NDF, dNDF	90	\$4,000.00	\$1,000.00
2006	CP, ADF, NDF, DM, dNDF	74	\$4,000.00	\$1,000.00
2007	ADF, ADL, DM, dNDF	40	\$4,000.00	\$1,000.00
1999-2007	Alfalfa Breeders Equation	Total Cost	\$69,621.59	\$12,603.93



## ***NIRS Forage & Feed Testing Consortium***

### ***Plant Breeders Committee***

The current calibration equation (03alford.eqa)

Constituent	N	Mean	SD	SEC	RSQ	SECV	1-VR
DM	526	92.88	1.96	0.37	0.97	0.40	0.96
CP	662	21.87	3.42	1.16	0.88	1.24	0.87
ADF	659	31.62	5.47	1.75	0.90	1.84	0.89
NDF	745	38.21	5.96	1.98	0.89	2.08	0.88
ADL	408	6.33	1.38	0.44	0.90	0.50	0.87
P	489	0.29	0.05	0.03	0.65	0.03	0.58
CA	484	1.39	0.30	0.12	0.84	0.14	0.79
K	474	2.44	0.71	0.23	0.89	0.26	0.87
MG	479	0.29	0.08	0.04	0.77	0.04	0.72
ASH	176	8.57	3.33	1.02	0.91	1.14	0.88
dNDF48	227	17.07	1.70	1.13	0.56	1.22	0.49
IVTDMD	223	78.34	3.80	1.72	0.79	1.88	0.76
RUP	73	21.94	2.39	0.99	0.83	1.38	0.67
CPD	73	89.91	2.14	0.89	0.83	1.23	0.67
DMD	72	69.25	4.19	2.06	0.76	2.54	0.64
NDFD1	224	44.08	4.73	2.78	0.65	2.98	0.60



## ***NIRS Forage & Feed Testing Consortium***

### ***Membership Committee***

Paul Vendrell – Chair  
Patty Laskowski  
Sam Stratton



***NIRS Forage & Feed Testing  
Consortium***

***Membership Committee***

**Current Membership Classes**

- **Regular Membership (25)**
- **Research/Non-Profit (5)**
- **Sponsorship (currently 0)**
- **Collaborators (4)**
- **Instrument Manufacturers (3)**



***NIRS Forage & Feed Testing  
Consortium***

***Membership Committee***

**Planned Membership Drive &  
Workshop**

- **Introduction of NIRSC to potential members**
- **Discussion / training on instrument platforms**
- **Other topics?**



***NIRS Forage & Feed Testing  
Consortium  
Membership Committee***

**Planned Membership Drive &  
Workshop**

- **Aug. 11-15 ? Aug. 18-22 ?**

**Hosted by The Samuel Roberts Noble  
Foundation**

**Ardmore, OK**



***NIRS Forage & Feed Testing  
Consortium  
Membership Committee***

**Noble's Facility:**

- **The Noble Foundation will cover the cost for the meals and housing.**
- **Noble's conference center has 18 rooms w/ two queen size beds each and two suites (queen bed & pull-out couch).**
- **Travel from airport to Noble Foundation would have to be arranged.**



***NIRS Forage & Feed Testing  
Consortium***

***White Paper Committee***

**Don Sapienza (chair thru 2007)**

**David Taysom**

**Neal Martin (current chair)**



***NIRS Forage & Feed Testing  
Consortium***

***White Paper Committee***

- **Writing completed in 2006  
after ADAS Testing Symposium**
- **Editing done during 2007**
- **Requesting approval to print**



***NIRS Forage & Feed Testing  
Consortium  
Finance Committee***

**Dave Whalen – Treasurer  
Jesse Sanders – 06-07 Treasurer  
Chuck Kahl  
Neal Martin  
Dan Undersander  
Patty Laskowski**



***NIRS Forage & Feed Testing  
Consortium  
Finance Committee***

**Summary Budget**

<b>Organization Maintenance Costs Estimate:</b>	
<b>Annual Basis</b>	
for basic calibration maintenance, monitoring, standardization, member support, program organization, & business.	Salaries & Consulting \$51,700.00
	Office/ Travel/ Instrument Maintenance/=Overhead \$9,000.00
	<b>TOTAL Operational Expenses \$60,700.00</b>
	Income from Annual Dues \$62,000.00
	<b>Operational Surplus/Deficit \$1,300.00</b>
<b>Calibrations &amp; Program Costs Estimate: Annual Basis</b>	
These costs are covered by equation fees.	Calibrations Update/ Commercial & Seed Breeders \$19,000.00
	Programs: Conference & Training Workshops \$12,000.00
	<b>TOTAL Expenses for Fee Calibrations &amp; Programs* \$31,000.00</b>
	<b>TOTAL Income from Fee Calibrations &amp; Programs* \$32,000.00</b>
	<b>Operational Surplus/Deficit \$1,000.00</b>
	<b>TOTAL Budget Expenses \$91,700.00</b>
	<b>TOTAL Consortium Income \$94,000.00</b>
	<b>Consortium surplus/deficit \$2,300.00</b>



***NIRS Forage & Feed Testing  
Consortium  
Finance Committee***

**Balance Sheet**

year	1998-1999	1999-2000	2000-2001	2001-2001short	2001-2002
beginning	\$0.00	\$4,932.00	\$35,217.00	\$28,997.00	\$2,971.00
end	\$4,932.00	\$35,217.00	\$28,997.00	\$2,971.00	\$25,825.00
excess or deficit	\$4,932.00	\$30,285.00	-\$6,220.00	-\$26,026.00	\$22,854.00
year	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
beginning	\$25,825.00	\$8,917.08	\$63,127.95	\$22,081.83	\$46,896.79
end	\$8,917.08	\$63,127.95	\$22,081.83	\$46,896.79	\$78,682.46
excess or deficit	-\$16,907.92	\$54,210.87	-\$41,046.12	\$24,814.96	\$31,785.67