

# Enogen Corn Silage Research Summary

Randy Shaver, Ph.D., PAS, ACAN  
UW-Madison

## Enogen Corn Silage Research Summary

Randy Shaver, Ph.D., PAS, ACAN



## Corn Silage StarchD

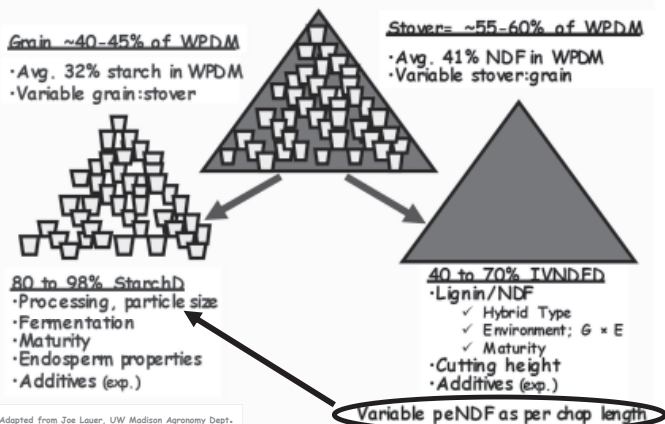
- Genetic or transgenic modifications studied
  - Comparisons of Flint, Dent, Reduced-Vitreousness Dent, Flourey, Opaque, Waxy Endosperm in Conventional Hybrids (numerous citations but few feeding trials)
  - Flourey-Leafy Hybrid (Ferraretto et al., 2015, JDS; Morrison et al., 2014, JDS abstr)
  - Flourey-BMR Hybrid (Morrison et al., 2016 JDS abstr)
  - $\alpha$ -Amylase expressed in kernel (Hu et al., 2010, JDS; trials in progress)

## High-Amylase Corn Hybrids

- Syngenta
  - Enogen Feed Corn (EFC)
- GMO
  - Greater kernel amylase as kernel matures
- Developed for ethanol industry
  - Conversion of starch to sugars prior to yeast fermentation
- Recent approval for feeding to livestock



## Whole-Plant Corn Silage



## Silage quality study 2016



### 2016 Field Survey Samples

- Small scale silage samples were collected and vacuum sealed at harvest
- Allowed to ferment for 60-75 days before analysis by Rock River Laboratory, Inc, Watertown, WI
- Comprehensive NIR data plus individual sugars, starch and *in situ* Starch Digestion by wet chemistry
- Final counts of included samples:
  - 165 Enogen samples
  - 160 GH/NK non-Enogen samples
  - 105 Competitive hybrid samples

# Silage quality study 2017

## 2017 Research Samples<sup>1</sup>

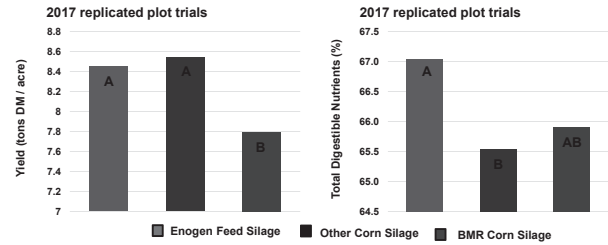
Hybrids and RM:

RM	Enogen and GH/NK non-Enogen hybrids										BMR hybrids			
	52	101	105	106	107	109	111	113	99	107	109	110		
Enogen	E09274	E101P5	E105T2	E106P48	E107B3	E109R3	E111P1	E113NB	F2F499	F0783XR	F2F627	106279A		
GH/NK*	G92743	G01P52	G05T82	G06P480	G07B39	G09E98	G11P16	G13N18	with 101			with 109		
Locations:														
MI State - Lansing	X	X							X					
MI State - Wood County, OH					X	X					X			
Penn State - State College		X		X	X	X			X	X	X			
UMN - Waseca			X	X		X	X	X	X	X	X	X		
J/G Ag Services, Mt Joy PA		X		X	X	X			X	X	X	X		
n =	1	3	1	3	3	4	1	1	3	3	4	1		

\*GH/NK non-Enogen hybrids

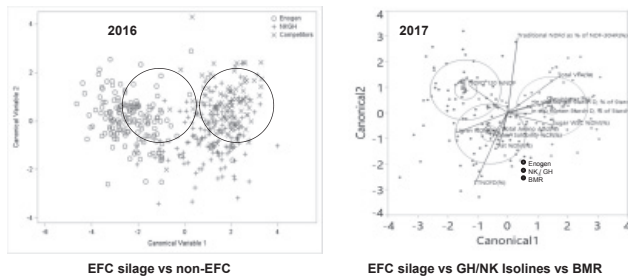
1- University of MN – Waseca, Pennsylvania State University and JG Ag Services, LLC.

- Significant yield advantage vs BMR, no amylase trait-related yield penalty
- Significantly more digestible nutrients than non-Enogen Feed corn hybrids



\*NRC Dairy '89 and '01 equations modified to incorporate isSD0, isSD7 and uNDF / NDF kd parameters; Rumen and intestinal starch digestion predicted with isSD0 and isSD7 parameters

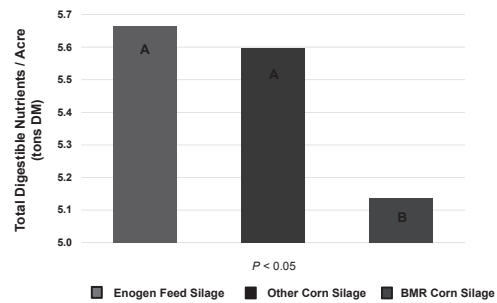
## Statistical modeling\* shows clustering of Enogen Feed silage samples vs other silage types



\* 2016 Discriminant analysis via SAS STEPDISC Procedure, 2017 Discriminant analysis via Multivariate procedure, JMP Pro v13.2.1, (SAS Institute, Cary, NC)

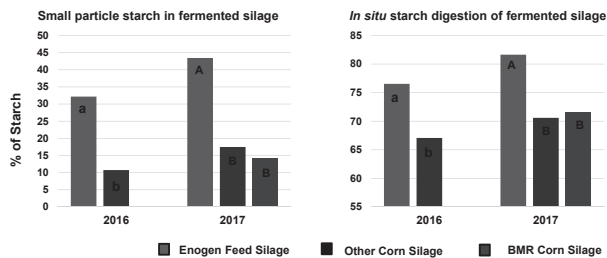
Source: Syngenta Contract Research

## 2017 replicated plot trials



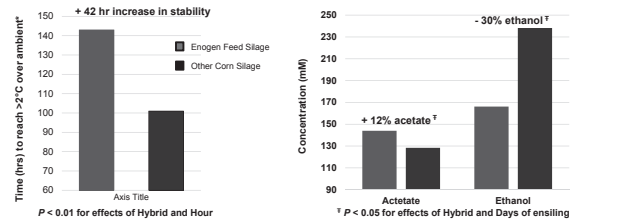
Source: Syngenta Contract Research

- No significant differences in starch content in either season
- Significantly more small particle starch (< 50µ) and greater 7-hr *in situ* ruminal starch digestion



Source: Syngenta Contract Research

- Significantly improved aerobic stability\*
- Significantly improved fermentation product profile



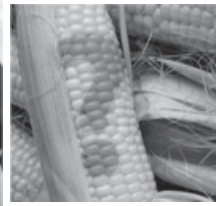
Source: Fermentation characteristics and aerobic stability of silage from Enogen® Feed Corn, 2018. A. Baker and J. S. Drouillard, Department of Animal Sciences & Industry, Kansas State University

## South Dakota Dairy Farm OFF vs. ON Comparison

- 1200 cow dairy farm; free-stall, milking parlor; pen-fed TMR; no BST
- EFC silage produced on-farm in 2016
- Prior to going on EFC silage the farm had been feeding 2015 conventional corn silage
- Began feeding EFC silage 12/9/2016
- Data obtained for the month prior to feeding EFC silage and for approximately 3 months while feeding EFC silage
  - Data collection included: Individual cow daily milk weights, pen-based DMI daily, and tank milk composition daily
  - Fecal starch and body condition scores monthly on random subsets of cows by SDSU Extension workers
- Milk yield & feed efficiency were numerically greater during ON period
  - Milk composition and body condition scores remained similar over the 4 months
  - No negatives reported

Summarized by R.D. Shaver

## Questions?



## Dairy transition and lactation study



- Controlled study with 48 multiparous Holstein cows in individual feeding gates at southeast WI commercial/contract research dairy farm; trial conducted in 2017
- Silage component of TMR as EFC or isoline (CON) silages grown in 2016
- Trial initiated ~ 30 days before calving
- Data collected through 90 DIM
  - Daily milk yield by cow through parlor electronic system; components analyzed weekly
- DMI measured daily through automated gate system
- Silage, paired TMR/fecal samples, body weights and conditions scores, and other data collected at frequent intervals

Rations formulated by on-site nutritionist

## Dairy transition and lactation study

### Lactation performance (1-90 DIM) LS Means\*

	Post CON	Post EFC
DMI, lb/d	62.6	62.6
Milk, lb/d	109.6	112.4
Fat, %	4.11	4.00
Protein, %	2.97	2.99
ECM, lb/d	116.3	117.9
ECM/DMI	1.90	1.92

No statistically significant treatment or interaction effects ( $P > 0.10$ )

Summarized by R.D. Shaver