

Corn silage quality and dairy cattle feeding

Randy Shaver

Dairy Science Department
University of Wisconsin - Madison



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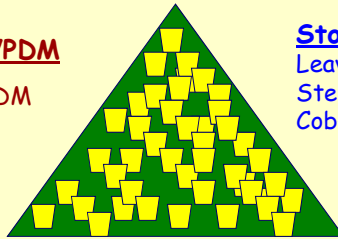
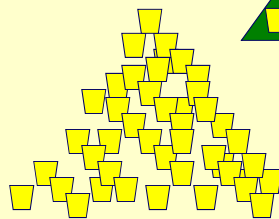
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Whole-Plant Corn Silage

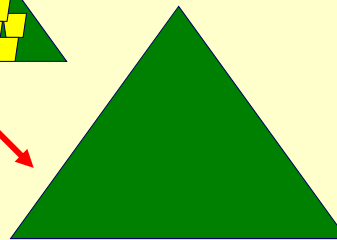
Grain ~40-45% of WPDM

- Avg. 30% starch in WPDM
- Variable grain:stover



Stover= ~55-60% of WPDM

- Leaves = 15% of DM
- Stem = 20-25% of DM
- Cob+Shank+Husk= 20% of DM



80 to 98% starch digestibility

- Kernel maturity
- Kernel particle size
- Endosperm properties
- Length of time in silo

40 to 70% IVNDFD

- Lignin/NDF
- Hybrid
- Maturity

NDF Content of Corn Silages

<u>DM basis</u>	<u>1 Std Dev</u>	<u>Average</u>	<u>1 Std Dev</u>
Dairyland 2002-2007 n=13k/yr.	37%	43%	49%
Dairy One 2002-2007 n=19k/yr.	38%	44%	50%

Starch Content of Corn Silages

<u>DM basis</u>	<u>1 Std Dev</u>	<u>Average</u>	<u>1 Std Dev</u>
Dairyland 2002-2007 n=13k/yr.	23%	30%	37%
Dairy One 2002-2007 n=15k/yr.	24%	31%	38%



48-h ivNDFD in Corn Silages

<u>% of NDF</u>	<u>1 Stdev</u>	<u>Average</u>	<u>1 Stdev</u>
Rock River 2003-2007; n=400/yr	51%	56%	61%
Dairyland 2002-2007; n=4500/yr	56%	61%	66%
Marshfield 2002-2007; n=500/yr	49%	58%	67%

30-h ivNDFD in Corn Silages

<u>% of NDF</u>	<u>1 Stdev</u>	<u>Average</u>	<u>1 Stdev</u>
Rock River 2007; n=800	45%	51%	57%
Dairyland 2007; n=1900	46%	51%	56%



Control and bm₃ corn silage DM, starch, NDF and IVNDFD from 11 trials published in JDS since 1999

	Control	bm₃
DM, % of as fed	34 ± 3	33 ± 4
Starch, % of DM	31 ± 3	30 ± 4
NDF, % of DM	42 ± 2	41 ± 2
30-h IVNDFD, % of NDF	46 ± 9	58 ± 8

Least-square means from meta-analysis on data from 11 trials with 17 treatment comparisons published in JDS since 1999

	Control	bm₃	Stats
DMI, lb/d	53	56	Significant
Milk, lb/d	83	87	Significant
Fat, %	3.67	3.59	Trend
lb/d	3.0	3.1	Significant
Protein, %	3.08	3.07	NS
lb/d	2.5	2.6	Significant

Responses to bm₃ corn silage

Oba & Allen, 2000, JDS; MSU

	Control	bm ₃	Control	bm ₃
Diet Forage	42%	42%	65%	65%
DMI, lb/d	53 ^b	54 ^a	47 ^y	50 ^x
Milk, lb/d	74 ^b	81 ^a	67 ^y	74 ^x
Milk Fat, %	3.67 ^a	<u>3.28</u> ^b	3.90	3.86
SCM, lb/d	70 ^b	72 ^a	65 ^y	72 ^x

Responses to bm₃ corn silage

Oba & Allen, 2000, JDS; MSU

13 lbs. less concentrate DM or 8 lbs. less corn DM fed



	Control			bm ₃
Diet Forage	42%			65%
DMI, lb/d	53			50
Milk, lb/d	74			74
Milk Fat, %	3.67			3.86
SCM, lb/d	70			72

Responses to "leafy" corn silage

Trial	DMI	Milk
MN, JDS, 1999	NS	NS
WI-Madison, JDS, 2000	NS	NS
Miner, JDS, 2001	NR	+3 lb.
WI-River Falls, JDS, 2002	+2 lb.	+3 lb.
MN, JDS, 2003	NS	NS
IL, 2006, JDS	NS	NS

Response to "leafy" corn silage

Ballard & co-workers, 2001, JDS; Miner

Item	Dual Purpose	bm ₃	"Leafy"
CS NDF, %	42	42	42
CS IVNDFD, % of NDF	32	46	28
Milk, lb/d	69 ^b	74 ^a	69 ^b
Milkfat, %	4.2	4.1	4.3
FCM, lb/d	71 ^b	75 ^a	72 ^b

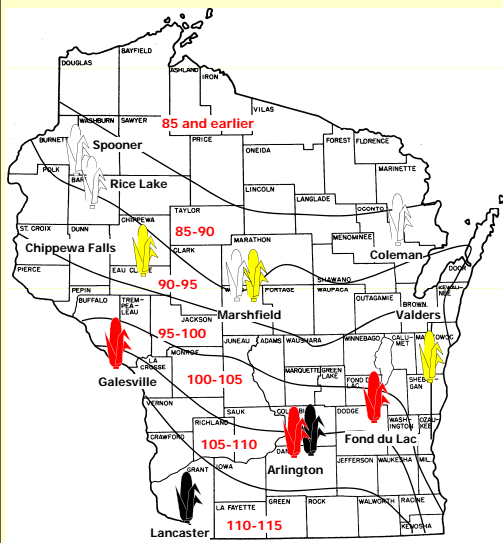
Response to a corn silage hybrid with both increased NDF & IVNDFD¹

Ivan et al., 2005

Item	LCW	HCW
CS NDF, %	49	53
CS 48-h IVNDFD	58	67
Diet, % CS	45	45
% NDF	31	33
% NDF from CS	22	24
DMI, lb/d	53 ^b	56 ^a
FCM, lb/d ²	70 ^b	75 ^a

¹40 mid lactation cows fed 55% forage diets

2009 Silage Locations



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Corn Agronomy Program



16
<http://corn.agronomy.wisc.edu>

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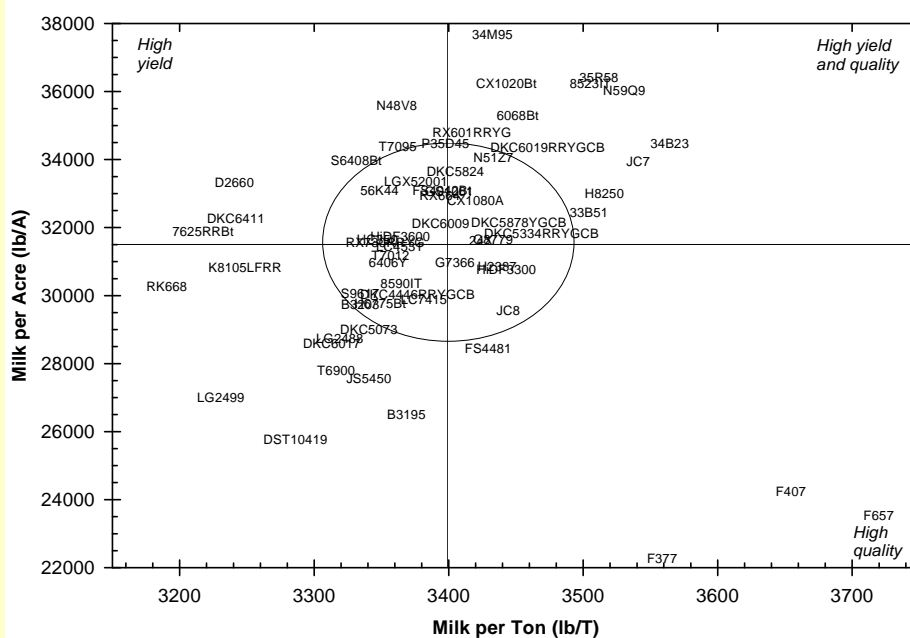
What is an average hybrid? (1995-2008)

Trait(s)	GxE	Forage yield	NDF	NDFD	Starch	Milk2006	
	N	Mg ha ⁻¹	g kg ⁻¹	g kg ⁻¹	g kg ⁻¹	kg Mg ⁻¹	kg ha ⁻¹
Normal	2636	17.1	471	600	297	1620	27500
Bmr	124	13.9	483	684	263	1690	23900
Leafy	209	17.5	482	593	275	1600	27900
LSD(0.05)		1.8	NS	18	39	60	2800



Example

Relationship between milk per acre and milk per ton of corn hybrids in South Central WI during 2002.



Selecting from the quadrants

- Lower left quadrant
- Low yield & low quality
- Why bother?

Selecting from the quadrants

- Upper left quadrant
- High yield & below average quality
- The dry cow, low-end cow, replacement heifer quadrant

Selecting from the quadrants

- Upper right quadrant
- High yield & high quality
- The high-cow quadrant

- Fine-tune selection on nutrition needs (i.e. NDFD vs. starch) & agronomic characteristics (i.e. Bt)

Selecting from the quadrants

- Lower right quadrant
- High quality & below average yield

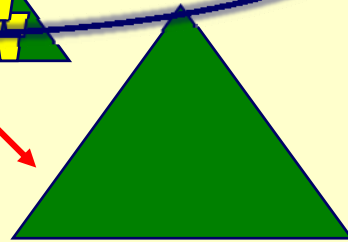
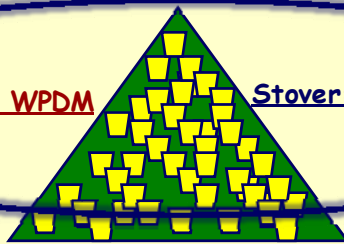
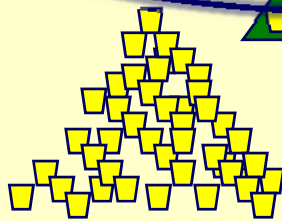
- How much yield drag can you live with?

- Evaluate your corn silage nutrient composition

Whole-Plant Corn Silage

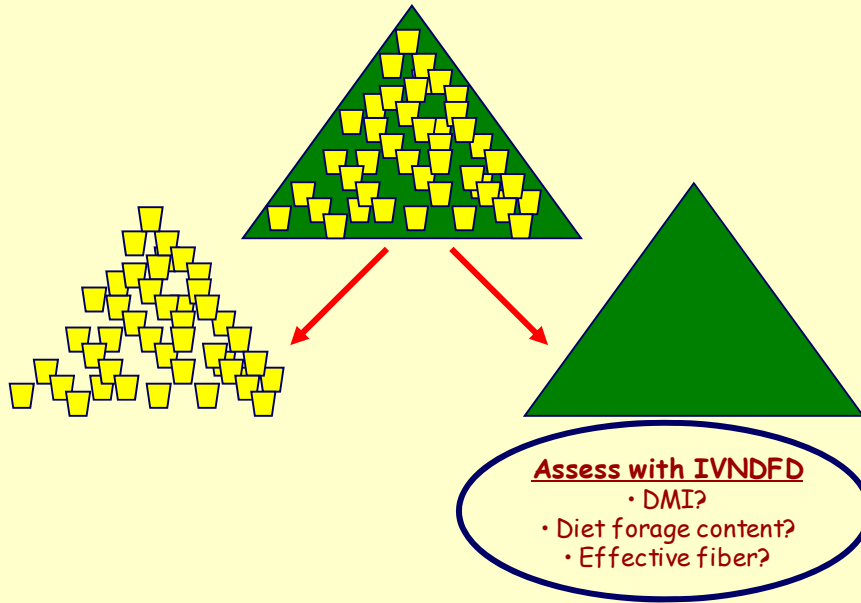
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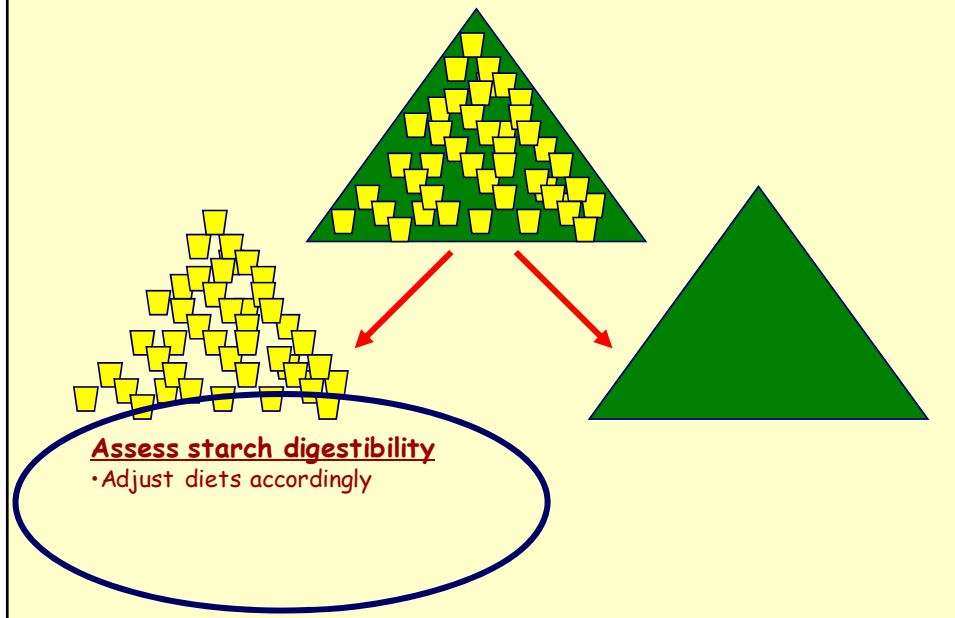


Proportions of grain & stover highly variable
- Assess with starch & NDF contents
- Adjust diets accordingly

Whole-Plant Corn Silage



Whole-Plant Corn Silage



Ruminal In situ starch degradability of corn silage over time in storage

Newbold et al., JDS, 2006 abstr.

Months in Silo	Starch % Degradability	CP
2	53	39
4	54	36
6	59	34
8	64	43
10	69	47

Visit UW Extension Dairy Cattle Nutrition Website

<http://www.uwex.edu/ces/dairynutrition/>