Can Alfalfa Compete with Corn Silage in Dairy Rations?

Expo Forage USDA Seminar

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Today's Program

- Part 1: Why do we feed forages to our dairy cattle?
- Part 2: Comparing corn silage vs. alfalfa

Forage Factor Number 1

Why do we feed forage to dairy cows?

- Fiber optimizes rumen digestion and fermentation
- Forages supports rumination to maintain optimal pH and VFA production
- Forages reduce feed costs
- Forages maintain milk yield and components

Fiber Requirements

- Physically effective NDF (fraction of NDF that contributes to the forage mat leading to cud chewing)
- Chemical NDF (level of lab-analyzed NDF including hemicellulose, cellulose, and lignin or cell wall)

Nutrient Needs

Carbohydrates

• Total NDF	28 to 33 percent
• Effective NDF	20 to 22 percent
• ADF	19 to 21 percent
• Lignin	3 to 4 percent
• Starch	22 to 28 percent
• Sugar	4 to 6 percent

Nitrogen / Protein

• Crude protein	15 to 17 percent
• RUP	32 to 36 percent
• MP	10 to 12 percent
• Soluble protein	5 to 6 percent

Forage Factor Number 2

What are my forage choices?

- Legumes (alfalfa today)
- Grasses
- Small grain forage
- Corn silage (today)
- Sorghum and sorghum hybrids
- Straw

Forage Factor Number 3

Which forage form?

- Hay
  - Dry
  - Baleage
- Silages
  - Bunkers, piles, and bags)
  - Upright silos
- Pasture
- Green chop

Forage Factor Number 4

What other factors may be important on your farm?

- Erosion control
- Nutrient management
- Double cropping potential
- Irrigate waste water / manure solids

Today's Discussion

Can alfalfa compete with corn silage?

- The Dave Letterman Approach: Top 10 questions to answer
- You will answer the questions, majority rules (Chicago rules)

Vote A for alfalfa; C for corn silage

• Dry matter per acre	A	C
• Harvesting a consistent forage	A	C
• Physically effective fiber	A	C
• Buffering capacity	A	C
• Protein aspects	A	C
• Carbohydrate aspects	A	C
• Harvesting factors	A	C
• Ration costs	A	C
• Fermentation profiles	A	C
• Density of silage	A	C

Number 10: Dry Matter Per Acre

Alfalfa 3.35 tons of dry matter per acre (USDA 2009 Crop Production Report in Aug 10, 2010 Hoard's Dairyman

Corn Silage: 8 tons per acre (U of WI summary, 1995 to 2008, 2665 observations)

Milk 2006 Calculations

- **Alfalfa** (5 tons per acre, 20% CP, 40% NDF, 45% NDFD
  - 2863 pounds of milk per ton
  - 14314 pounds of milk per acre

- **Corn silage** (1995 to 2008—U of WI)
  - 3220 pounds of milk per ton
  - 26,000 pounds of milk per acre

Number 9: Harvest a consistent nutrient profile forage

Corn Silage(1033)	CP	NDF	ADF	Lignin
Content	8.5	44.5	27.5	4.0
Standard deviation	1.2	5.3	3.3	1.0

Alfalfa Silage (8567)				
Content	20.0	36.7	30.2	6.2
Standard deviation	3.0	6.5	4.8	1.8

Number 8: Physical effective fiber--particle size

• Hay	90 to 95%
• Processed hay (tub ground)	40 to 65%
• Haylage	40 to 80%
• Corn silage	30 to 70%

Penn State Separator

	Top	2nd	3rd	Bottom
	----------% (as fed)----------			
TMR	10-15	> 40	< 30	< 20
Haylage	> 40	> 40	<20	< 5
Corn silage	5-15	> 50	< 30	< 5

(3/4 TLC-Process)

Number 7: Buffering Capacity

Natural buffering capacity in the rumen

Alfalfa wins due to it mineral composition

Low research response with added sodium bicarbonate when fed to alfalfa based ration

Rations over 50% corn silage of the total ration dry matter requires 200 to 250 grams of sodium bicarbonate (added 5 to 8 cents per cow per day)

Number 6: Protein Aspects

Crop	Alfalfa	Corn Silage
Crude protein	X	
Soluble protein		X
RDP	X	
RUP	x	
MP		X

Number 5: Carbohydrate Aspects

Crop	Alfalfa	Corn Silage
ADF		X
NDF	X	
NDFD		X
Lignin		X
Starch		X
Sugar	X	
Soluble fiber	X	

Forage NDFD

	Target	Range
	---- % on DM basis ---	
Corn silage	> 55	44 – 72
Legume/ grass hay	> 50	38 - 75
Legume / grass silage	> 50	32 - 79

Point Number 4: Harvesting Factors

	Alfalfa	Corn Silage
Frequency of harvest		X
Soil compaction		X
Weather risks		
–Spring	X	
–Summer	X	
–Fall		X
–Winter		X

Number 3: Ration costs

- 1400 lb Holstein cow body weight
- 80 lb of milk with 3.7% fat
- Alfalfa at $150 a ton hay equiv
- Corn silage at $32/ ton at 33% DM
- Corn grain at $3.50 a bushel
- SBM-44% at $350/ton

Economics of Corn Silage
(Spartan II Least Cost)

	---------- lb DM /cow/day------		
Alfalfa	20.0	10.0	5.0
Corn Silage	10.3	22.5	28.9
Corn	15.7	9.7	6.8
SBM	5.1	7.7	9.0
	---------- $ /cow /day------		
Feed cost	4.28	4.14	4.08

Number 2: Silage Fermentation

Measurement	Legume/grass	Corn Silage
Dry matter (%)	35 to 50	30 to 35
pH	4.3 to 4.7	3.8 to 4.2
Lactic acid (%)	4.0 to 6.0	5.0 to 10.0
Acetic acid (%)	0.5 to 2.5	1.0 to 3.0
Propionic acid (%)	<0.25	<0.10
Butyric acid (%)	<0.25	<0.10
Ethanol (%DM)	<1.0	<3.0
Ammonia (%CP)	<12.0	<8.0
Lactic/Acetate	>2.5	>3.0
Lactic (% total)	>70	>70

Number 1: Silage Compaction

Over 15 lb of dry matter per cubic foot

- –Bags: > 12 lb
- –Bunkers / pile: > 15
- –Possible goal: ` > 18

Dry Matter Loss as Influenced by Silage Density

DM Density (lbs DM/ft3)	DM Loss, 180 days (%)
10	20.2
14	16.8
15	15.9
16	15.1
18	13.4
22	10.0

Ruppel (1992)

Hutjens' Biased Answers

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• Protein aspects	A	C
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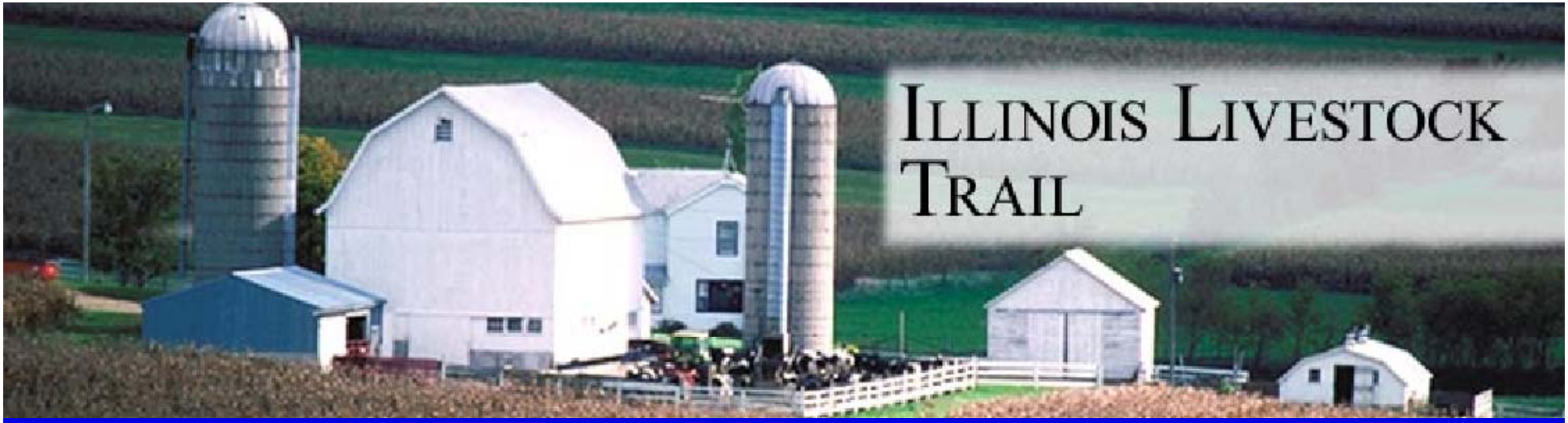
• Harvesting factors	A	C
• Ration costs	A	C
• Fermentation profiles	A	C
• Density of silage	A	C

In Summary: Making Alfalfa More Competitive

- Emphasis on nutrient plans
- Stack herbicide traits reducing weed and grass pressure improving quality
- Stack pesticide traits reducing spraying, delayed harvest, and improve quality
- Shift the protein profile (more RUP)
- More fermentable rumen carbohydrates
- Reach yield potential
- Fewer harvesting trips



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