Supplementation for the grazing cow: corn and alternatives

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Why Supplementation Talk Again?

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Why supplement cattle consuming forage based rations?

- Improve animal performance
- Stretch forage supply
- Improve profitability

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Factors affecting supplementation

- Composition of cool-season pastures
- Dry matter intake of cows on pasture
- Pasture protein
- Economics

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Factors affecting pasture DMI

- Nutrient requirements of cattle
- Enlargement of the digestive tract
- Grazing behavior
- Pre-grazing pasture mass
- Amount of pasture offered per cow

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Calculating DMI

- It is important for DMI to be actually measured or accurately estimated
  - proper diet formulation
  - prevent underfeeding or overfeeding
  - promote efficient nutrient use
  - Calculate by direct measure of pastures or use the subtraction method

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Grazing behavior

- Increasing concentrate amount reduces grazing time
- Supplementation of 17 lb. of corn reducing grazing time by 75 to 104 minutes per day (Bargo, 2002)
- Average grazing time is 580 minutes/day for un-supplemented cows
- Grazing time reduced by 12 min/d for every kg of concentrate

Pasture protein

- Crude protein intake is good if capture in rumen
- Fermentable carbohydrates drive microbial growth in rumen
- Corn increases microbial yield by 1.4 fold
- Excess ammonia may costs energy (3 to 6 lb of milk) and affect reproduction

Substitution rate

- For each unit of grain fed, pasture dry matter intake decreases 0.5 to 0.8 lb (Muller, 1998)
- With more grain, total dry matter intake will likely increase
- Feeding more grain extends supply of pasture

Supplementation summary

Table 2. Summary of Grazing Studies in Lactating Cows When the Supplemented Energy Differed

Year	Length of Study	Cows	Supplement	Milk Yield	Fat %	Protein %
1978-79	'78 - 16 wk '79 - 20 wk	13 Holsteins per treatment	8# corn – mineral 12# corn – mineral 16# corn – mineral	51.5 52.4 54.5	3.5 3.3 3.2	3.2 3.1 3.2
1980	18 wk	8 Holsteins per treatment	16# corn – mineral TMR (50# limit)	51.5 49.7	3.1 3.2	2.9 2.8
1994[1]	8 wk	5 Holsteins & 3 Jerseys per treatment	10# corn-soy w/ clover-grass 15# corn-soy w/ clover-grass 20# corn-soy w/ clover-grass 15# corn-soy w/ Alfalfagraze	54.1 54.8 54.1 56.1	3.7 3.6 3.8 3.8	3.2 3.2 3.3 3.3
1995[2]	14 wk	8 Holsteins 8 Jerseys 8 Holsteins 8 Jerseys	12# high fiber 12# high fiber 20# high fiber 20# high fiber	61.4 51.0 67.8 52.4	3.6 4.8 3.6 4.5	3.0 3.4 2.9 3.5
1997	10 wk	9 Holsteins per treatment	15# coarse corn 15# fine corn 17# high-moisture corn 11# high-moisture corn	66.2 65.3 67.8 67.1	3.2 2.9 3.1 3.1	3.0 3.0 3.0 3.0

Carl Polan, Virginia Tech

Level of supplementation

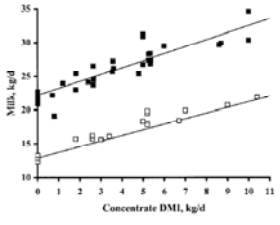

Figure 2. Relationship between milk production (MP) and concentrate DMI (CDMI) by grazing dairy cows supplemented with different amounts of concentrate (■ studies with cows < 90 DIM or > 28 kg milk/d at the beginning of the experiment; Bargo et al., 2002a; Delahy et al., 2001; Gibb et al., 2002; Reis and Combs, 2000b; Sayers, 1999; □ studies with cows > 160 DIM or < 23 kg milk/d at the beginning of the experiment; Robaina et al., 1998; Sayers, 1999; Walker et al., 2001). Close and open squares correspond to actual values, regression

Bargo et al. 2003

Expected Milk Response

Table 1. Expected milk yield response of high producing cows to increasing increments of concentrate feeding.

Supplemental concentrate fed (lb)	Expected lb. milk/lb each additional lb. of concentrate
0-4	1.2 to 1.3
4-8	1.0 to 1.2
8-12	0.8 to 1.0
12-16	0.65 to 0.8
16-20	0.4 to 0.65

Muller, 1998

Grain feeding guidelines

4% FCM	Spring		Summer		Fall	
Production (lb/day)	lb	G:M[c]	lb	G:M[c]	lb	G:M[c]
>80	20	1:4 to 1:5	25-27	1:3	20	1:4 to 1:5
70	16-18	1:4 to 1:5	21-23	1:3 to 1:4	16-18	1:4 to 1:5
60	12-14	1:5	15-18	1:3 to 1:4	12-14	1:5
50	8-10	1:5 to 1:6	10-12	1:4 to 1:5	8-10	1:4 to 1:5
>40	6-8	1:6 to 1:7	8-10	1:5 to 1:6	6-8	1:6 to 1:7

Muller, 1998

When I need to supplement, does it matter what I supplement?

Alternative feeds

- High quality forage (40% NDF, 20% starch)
- Grains with similar carbohydrates to corn
- High sugars in ration (5% sugar in ration)
  - Molasses
- Use more corn silage, if available

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Alternative feeds

- Barley (95% energy of corn, high fiber)
- Oats (90% energy of barley, higher fiber)
- Wheat (high protein, energy similar to corn)
- Peas (similar energy to wheat)

CROPP, "Ask the experts", September 2011

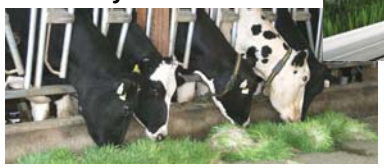
Replacing corn

- Monitor milk production
- Watch protein test
- High MUN (milk urea nitrogen)
  - High levels can affect health and fertility
- Observe manure and body condition

CROPP, "Ask the experts", September 2011

Forage supplement

- Forage supplements decrease pasture dry matter intake more than concentrates
- Fodder systems???



Molasses

Primary energy source on some organic dairies

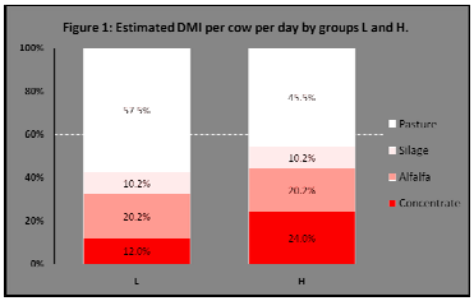
Molasses

- 20 organic Jersey cows, UNH organic dairy
- Fed at 1/3rd substitution rate to corn meal
- Poured over baleage
- Worked for some and did not work for some

Molasses results

- Pasture intake and total DMI was higher for cows fed molasses vs. corn meal
- No differences observed in milk production
  - 28.2 lb (molasses) vs. 26.0 lb (corn meal)
- Milk components were similar
- Reduced MUN in cows fed molasses
- Economics???

California State-Chico research



Low versus high supplementation

Trait	Low Supplement	High Supplement	Difference
Cows	36	37	
Milk (lb)	48	51	–3
Fat (%)	3.7	3.8	–0.1
Protein (%)	3.3	3.2	+0.1
SCC (1,000s)	127	134	–7
SCS	3.10	3.26	+0.16

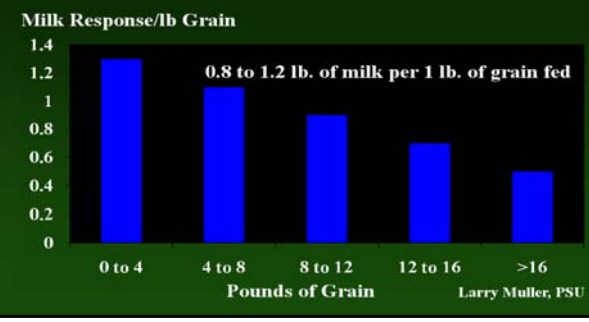
No significant difference between low or high supplemented cows
California State University – Chico organic dairy

Low versus high supplementation

Trait	Low Supplement	High Supplement	Difference
Cows	36	37	
Grain intake (lb)	5.3	10.6	–4.7
Pasture intake (lb)	25.3	20.0	+5.3
Grain ($/cow/d)	1.27	2.53	–1.26
Pasture ($/cow/d)	2.03	1.60	+0.43
Feed cost/cwt. ($)	9.72	10.64	–0.92
IOFC ($)	7.43	6.91	+0.52

California State University – Chico organic dairy

Expected Milk Response to Increasing Increments of Grain



Conclusions

- Grazing cows are limited in milk production by insufficient feed intake
- 1 pound of grain per 4 lb of milk
- Economics will drive supplementation level and what is supplemented

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