Driving Milk Yield: *Nutrition Breakthroughs from the Journal of Dairy Science 2024*

P. J. Kononoff, PhD
Department of Animal Science, University of Nebraska-Lincoln, Lincoln, NE, 68583-0908
Editor-in-Chief, Journal of Dairy Science

14th Annual SaskMilk Dairy Info Day
February 11, 2025 at the Brian King Centre,
Warman, SK

Fiber digestibility

Q1. Do you incorporate any feed additives or management strategies to improve fiber digestibility?

“A one-unit increase in forage NDF digestibility associated with 0.17- and 0.25-kg/d increases in DMI and 4% FCM production, respectively (Oba and Allen, 1999).”

A feed additive something old is new again

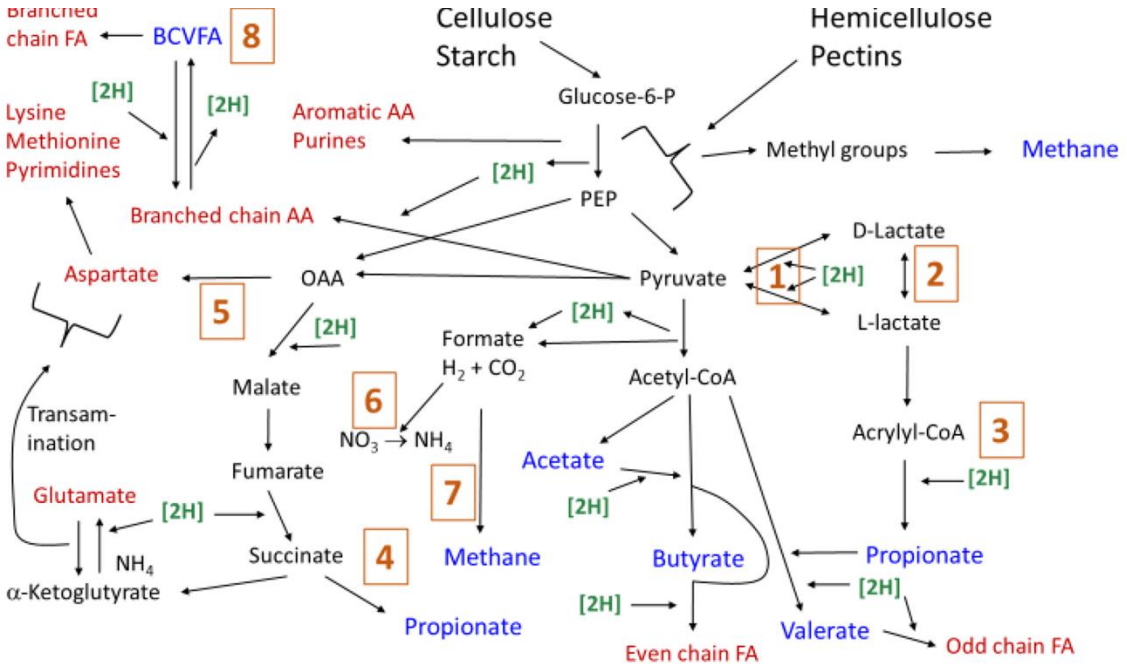
J. Dairy Sci. 108:1408–1418
https://doi.org/10.3168/jds.2024-25358

Supplementation of isoacids to lactating dairy cows fed low- or high-forage diets: Effects on performance, digestibility, and milk fatty acid profile

M. R. A. Redoy,[1]* S. Ahmed,[2]* J. Bonilla Urbina,[2] D. H. Kleinschmit,[3] M. T. Socha,[3] P. Salunke,[2] and M. E. Uddin[1]†
[1]Department of Animal Science, University of Connecticut, Storrs, CT 06269
[2]Department of Dairy and Food Science, South Dakota State University, Brookings, SD 57007
[3]Zinpro Corporation, Eden Prairie, MN 55344

What are Isoacids (Firkins et al., 2024)?

- Not currently approved for use in Canada .
- Isoacids, also known as branched-chain volatile fatty acids (BCVFA), (isovaleric, 2-methylbutyric, and isobutyric acids).
- Derived from the branched-chain amino acid
- Play a role in improving fiber digestibility, enhancing microbial protein production, and boosting milk production efficiency.
- Create a balanced microbial environment in the rumen, which is essential for breaking down fiber and producing acetate, a key component for milk fat synthesis.



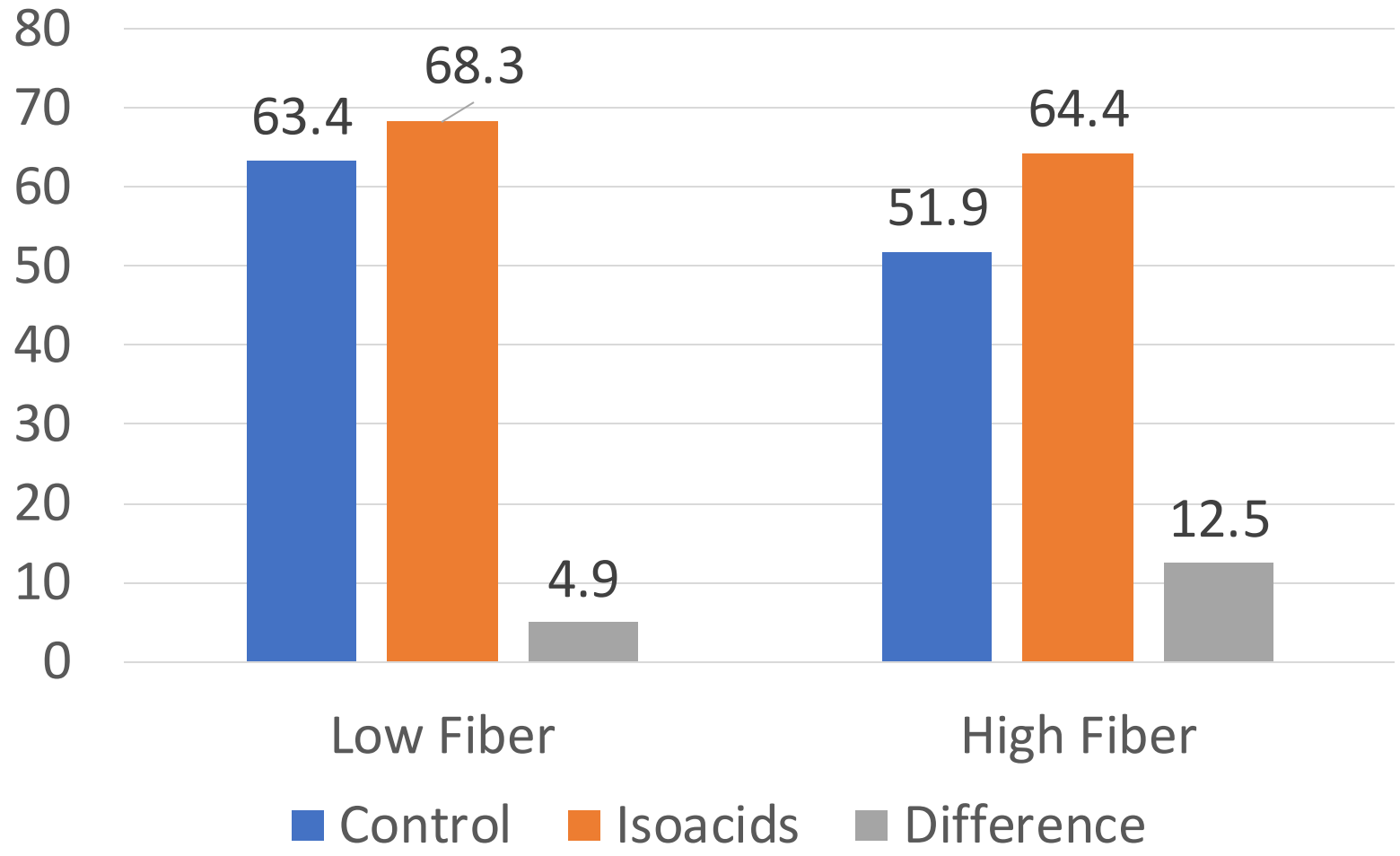
	Treatment	
	Low forage	**High forage**
Corn silage	30.8	43.9
Alfalfa hay	12.7	12.9
Alfalfa haylage	7.96	8.30
Cottonseed fuzzy	3.23	1.95
Corn grain	22.4	16.4
Soybean meal, solvent 48% CP	4.54	4.78
Expellers soybean meal	4.78	5.00
Soybean hulls	10.1	2.95
Sodium bicarbonate	1.10	1.20
Limestone, ground	0.68	0.59
Salt, white	0.32	0.33
Urea	0.19	0.19
Calcium phosphate (mono)	0.17	0.18
Magnesium oxide	0.17	0.18
Vitamin mineral premix	0.23	0.25
Bypass fat	0.65	0.96

J. Dairy Sci. 108:1408–1418
https://doi.org/10.3168/jds.2024-25358

Supplementation of isoacids to lactating dairy cows fed low- or high-forage diets: Effects on performance, digestibility, and milk fatty acid profile

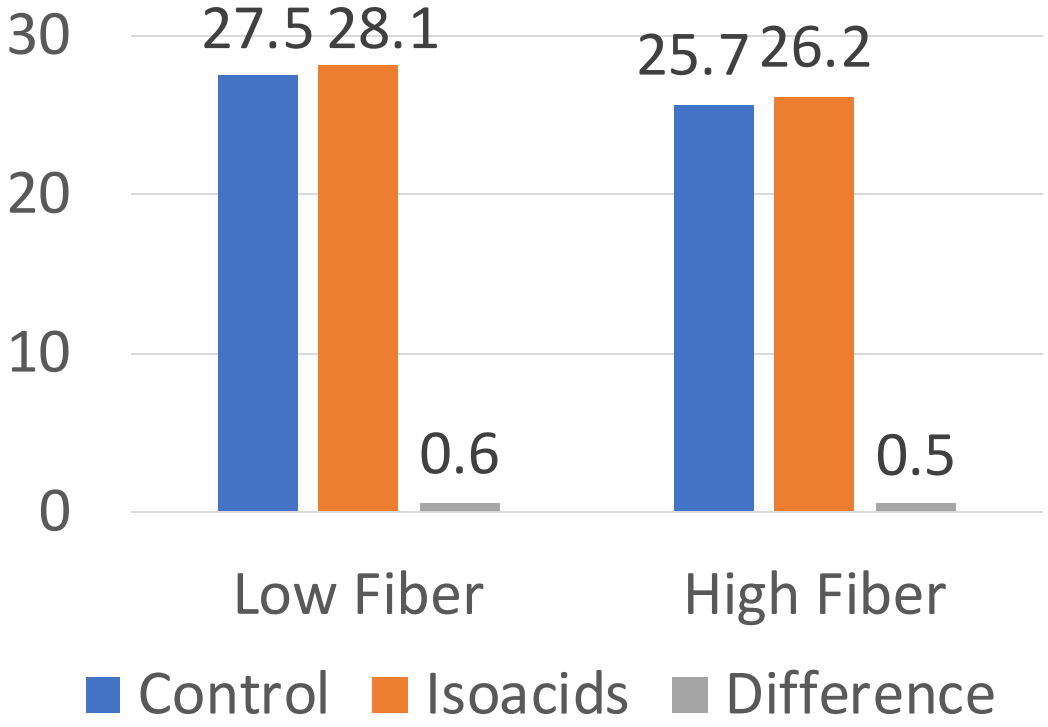
M. R. A. Redoy,[1]* S. Ahmed,[2]* J. Bonilla Urbina,[2] D. H. Kleinschmit,[3] M. T. Socha,[3] P. Salunke,[2] and M. E. Uddin[1]†
[1]Department of Animal Science, University of Connecticut, Storrs, CT 06269
[2]Department of Dairy and Food Science, South Dakota State University, Brookings, SD 57007
[3]Zinpro Corporation, Eden Prairie, MN 55344

Fiber Digestibility (3-5% is often “expected”)



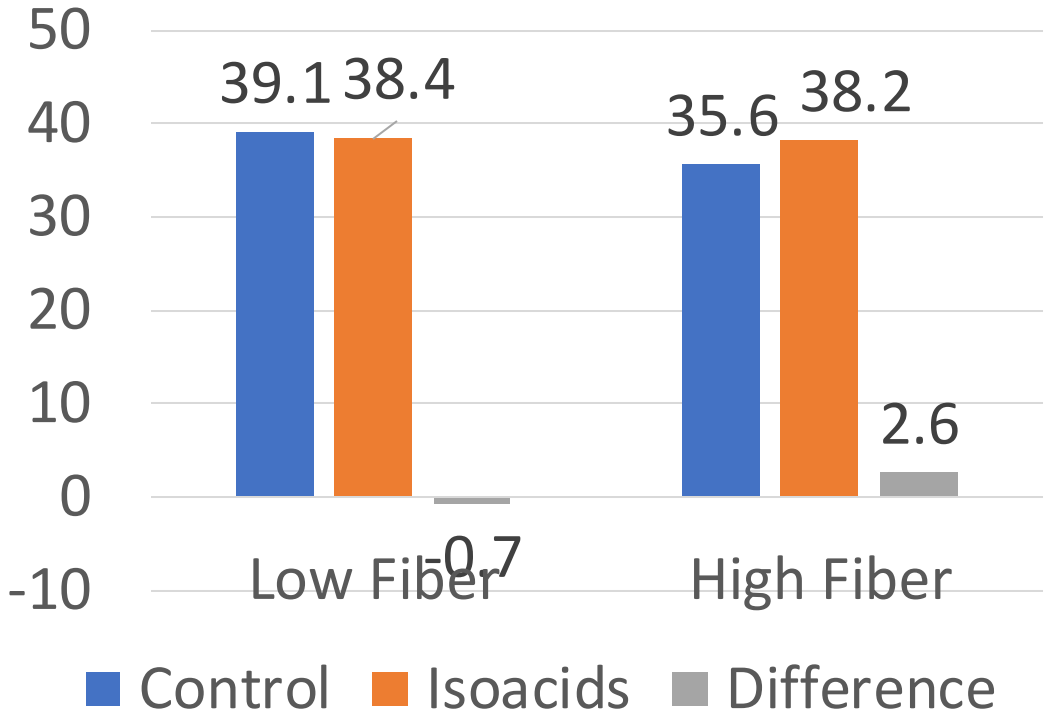
(Redoy et al., 2024)

Dry matter intake, kg/d (P = 0.13)



(Redoy et al., 2024)

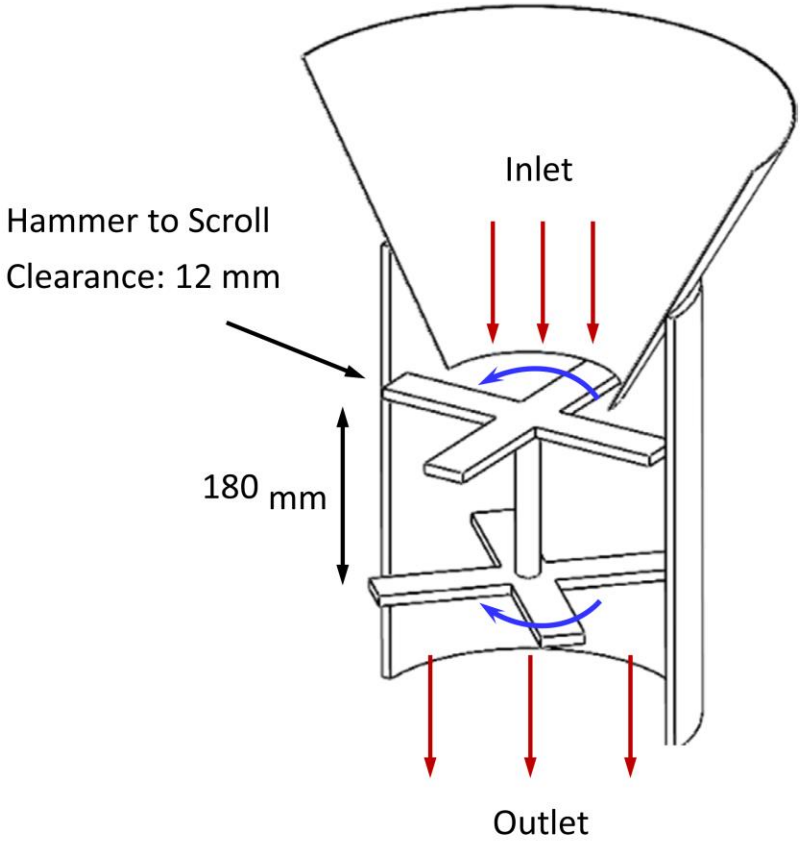
Milk Yield, kg/d (P = 0.04)



Note: no differences were observed in % fat or protein but differences were observed yields

Mechanically processed alfalfa

Impact processor



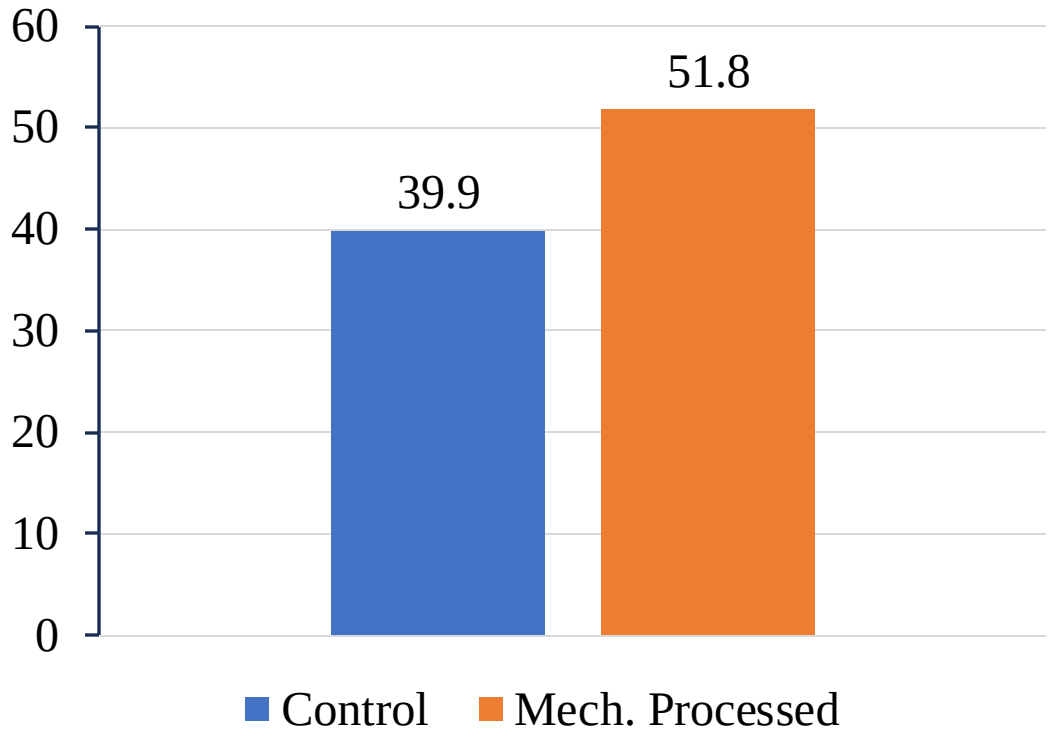
Wilted alfalfa silage: shredded with highspeed hammers

Note original TLC was 10 and 22 mm

Pintens et al., 2001; Grass Forage Sci. 2022;77:55–65

Mechanically processed alfalfa as a feed

Total Tract NDF Digestibility, (11.9% difference)



J. Dairy Sci. 108:485–498
https://doi.org/10.3168/jds.2024-25288

Effect of feeding mechanically processed alfalfa silage on production performance of mid-lactation dairy cows

K. M. Kennedy,[1]* D. A. Pintens,[2] K. F. Kalscheur,[1]† K. J. Shinners,[2] J. C. Friede,[2] and M. F. Digman[2]
[1]US Dairy Forage Research Center, USDA-ARS, Madison, WI 53706
[2]Department of Biological Systems Engineering, University of Wisconsin–Madison, Madison, WI 53706

	CON	MPR	SEM	P-value
DMI, kg/d	28.0	27.3	0.30	0.13
Milk yield,[3] kg/d	46.1	46.8	0.41	0.21
Milk components				
Fat, %	3.81	3.93	0.04	0.03
Fat, kg/d	1.75	1.83	0.02	0.01
Protein, %	3.09	3.10	0.01	0.42
Protein,[3] kg/d	1.42	1.45	0.01	0.13
FCM, kg/d	44.7	46.2	0.44	0.02
FCM/DMI	1.60	1.69	0.02	<0.01

Particle size	Control	MPR	Recommendation
>19 mm	2.81	2.02	2 - 8
8–19 mm	36.6	33.6	30 - 50
4–8 mm	20.7	22.5	10 - 20
≤4 mm	39.8	41.9	30 - 40

Kennedy et al., 2024; J. Dairy Sci. 108:485–498

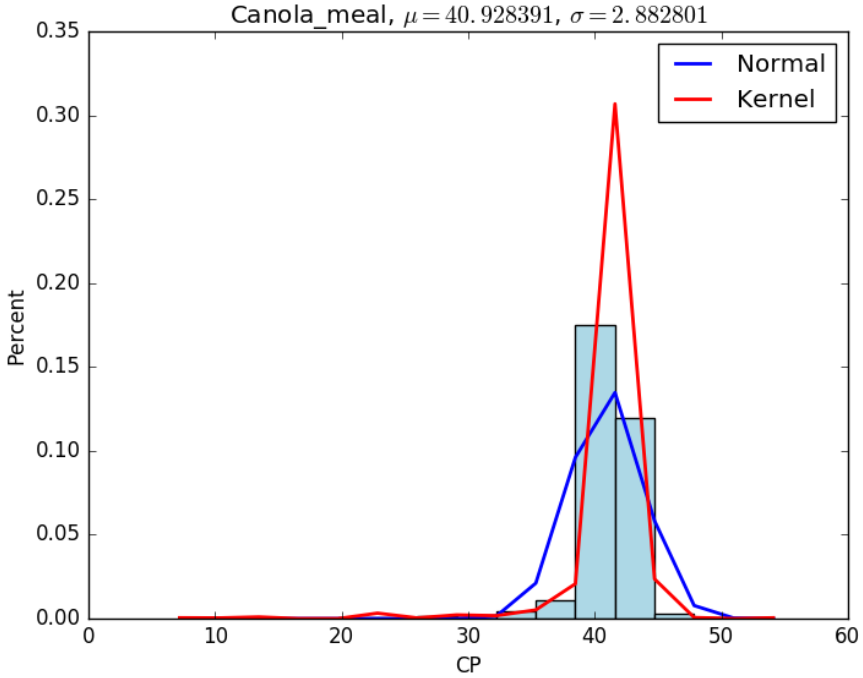
Feeding high protein feeds

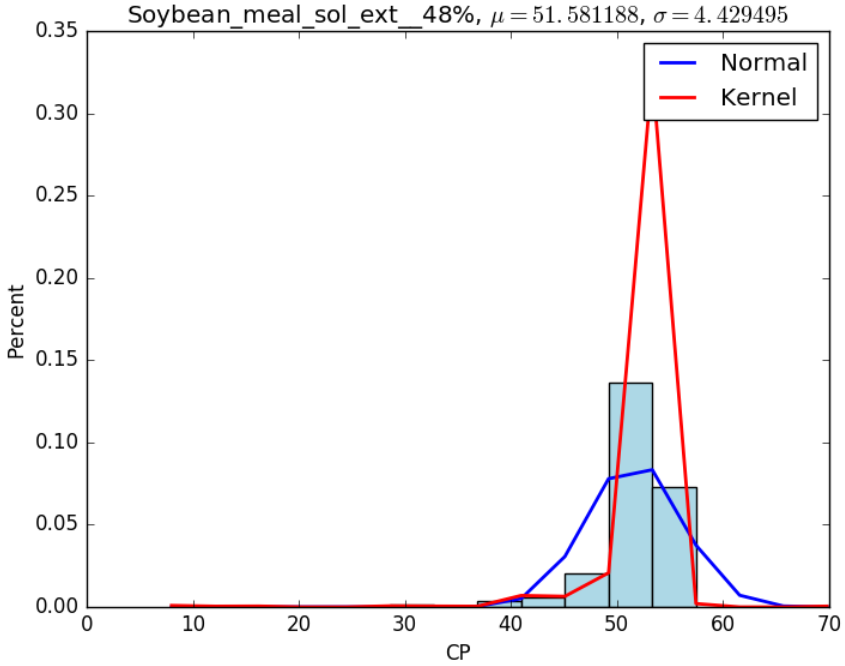
Q2. What factors do you consider most important when selecting a high-protein feed ?

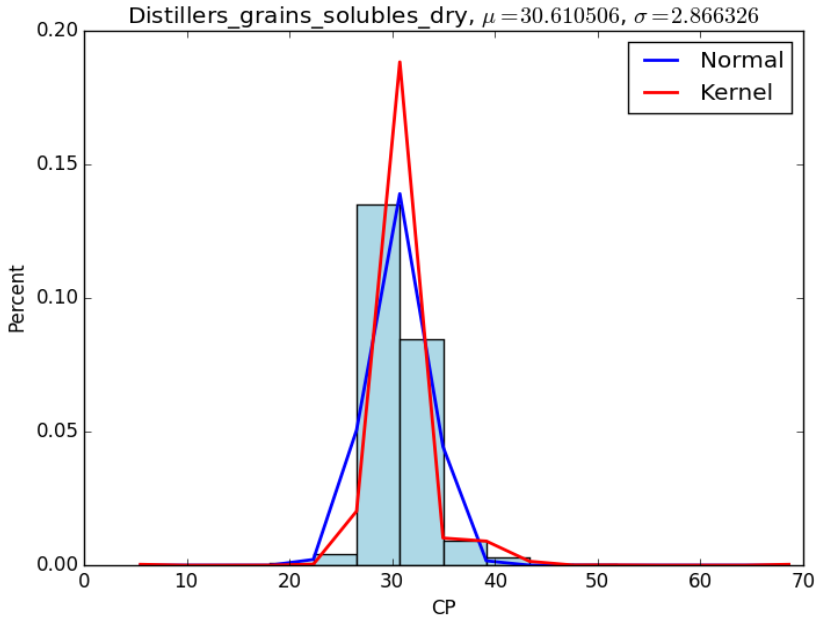
Why do we feed canola meal?

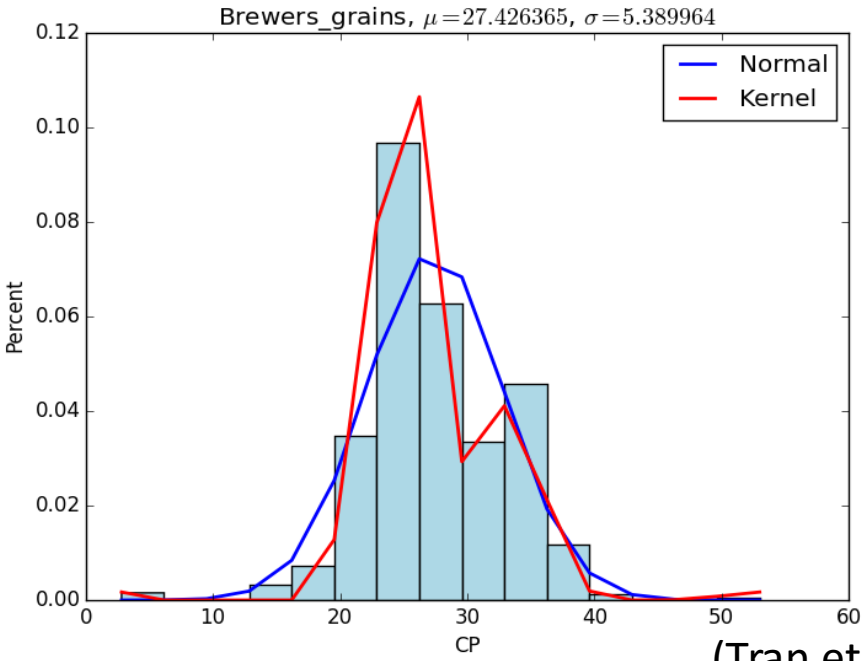
Nutrient content/digestibility

	Units	**Canola meal**	**SBM**	**DDGS**
Crude protein	% DM	41.5	52.6	31.0
Lysine	% CP	5.51	6.16	2.81
Methionine	% CP	1.97	1.38	1.98
RUP, Base	% CP	32	33	47
dRUP	% RUP	74.0	91.0	75.0
NDF	% DM	29.0	11.1	30.8
NDFD48	% NDF	49.4	85.7	47.2
Total Fatty Acids	% DM	2.51	1.1	7.9
Dig Energy, Base	Mcal/kg	3.14	4.0	3.44







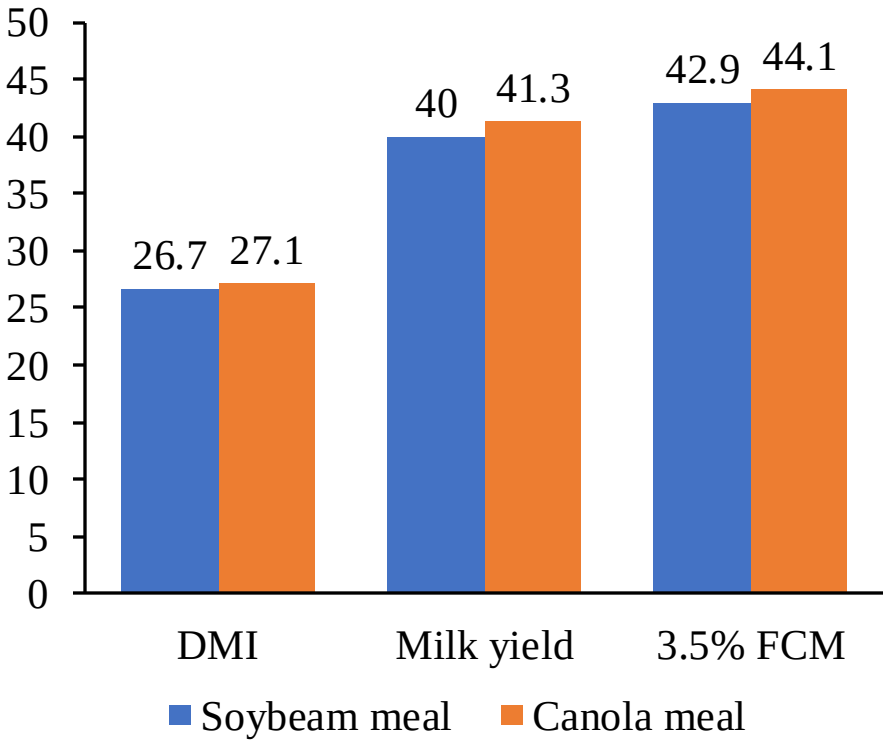


(Tran et al., 2019)

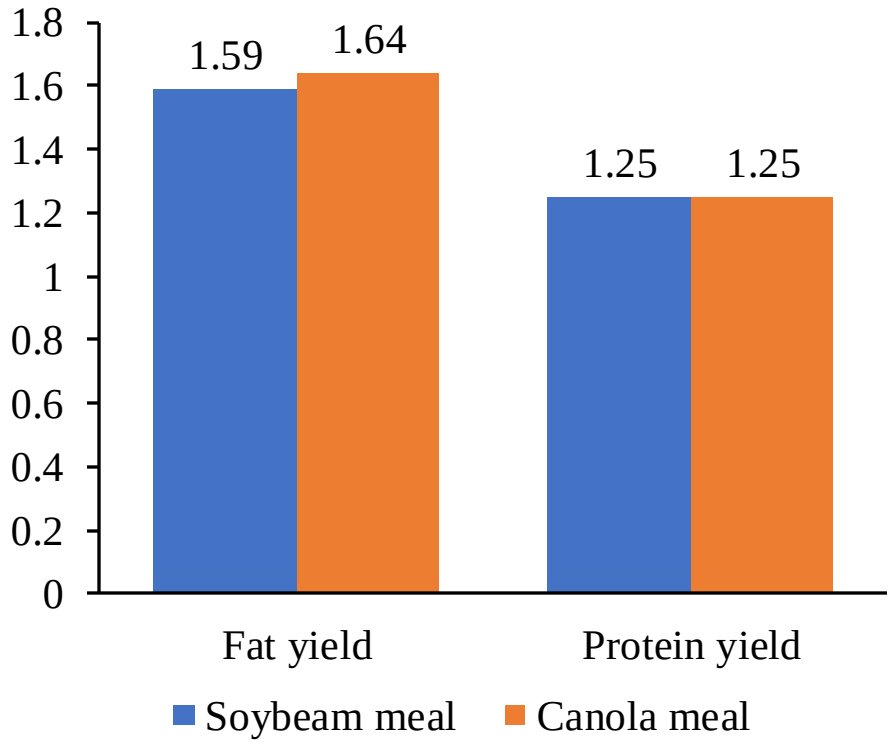
“Past Performance”: Feeding Canola Meal (CM)

“Feeding CM produced greater daily milk yield than SBM.” - Huhtanen et al., 2011

DMI and Milk yield, kg/d



Milk composition, kg/d

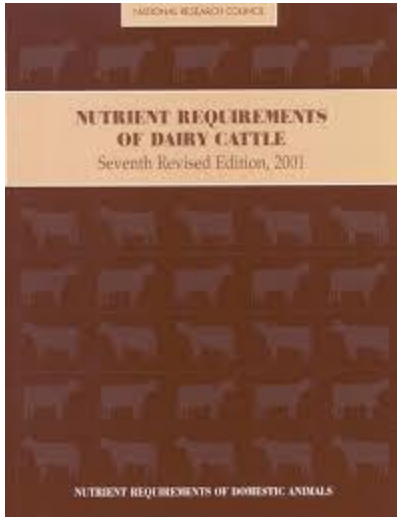


(Paula et al., 2017)

J. Dairy Sci. 107:9262–9276
https://doi.org/10.3168/jds.2024-24922

Effects of protein and forage source on performance and splanchnic and mammary net fluxes of nutrients in lactating dairy cows

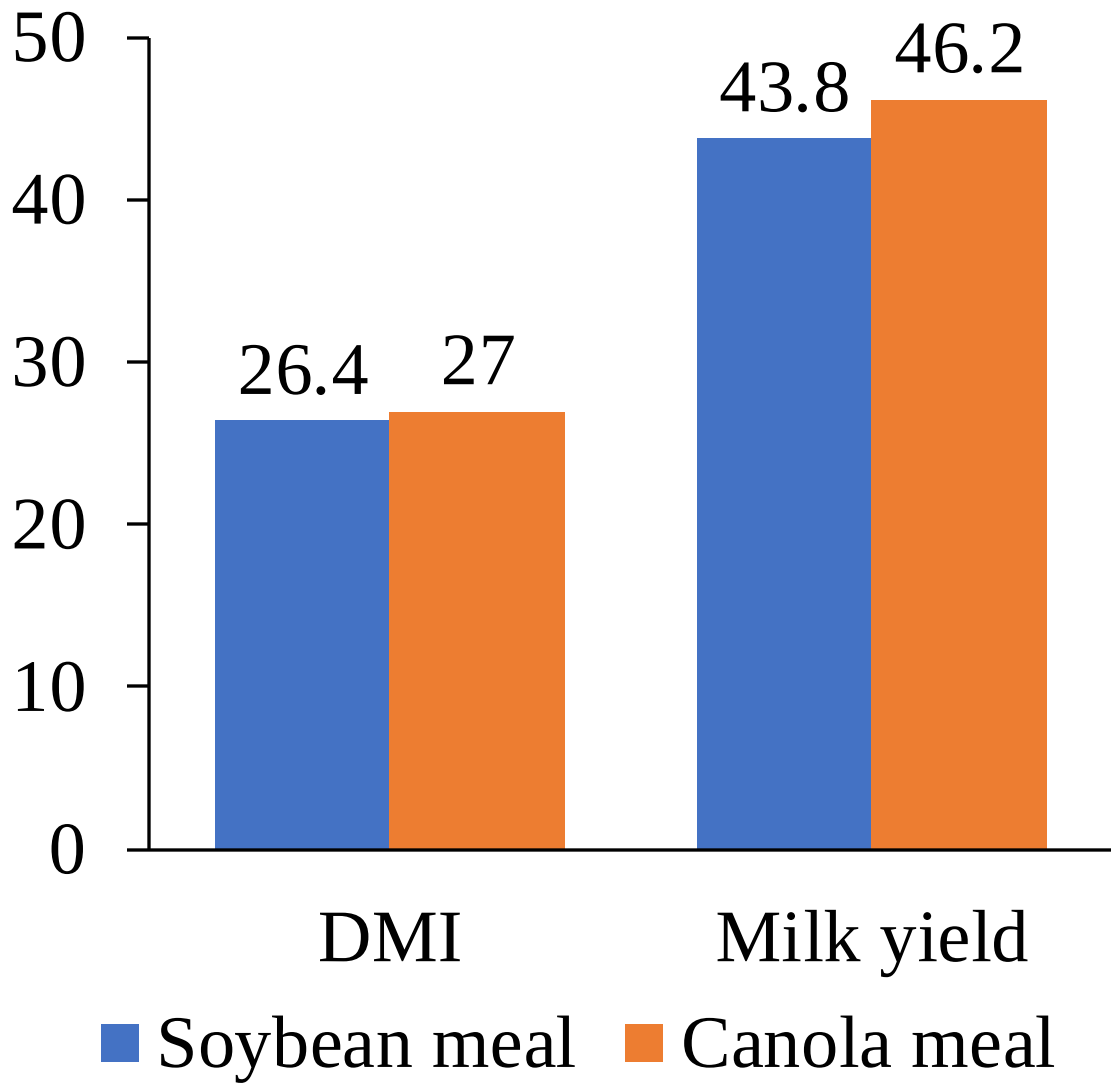
C. E. Galindo,[1] D. R. Ouellet,[2] G. Maxin,[1]* R. Martineau,[2] D. Pellerin,[1] and H. Lapierre[2]†
[1]Département de Sciences Animales, Université Laval, Québec, QC G1V 0A6, Canada
[2]Sherbrooke Research and Development Centre, Agriculture and Agri-Food Canada, Sherbrooke, QC J1M 0C8, Canada



Soybean meal

Canola meal
Predicted to have a reduced supply of metabolizable protein

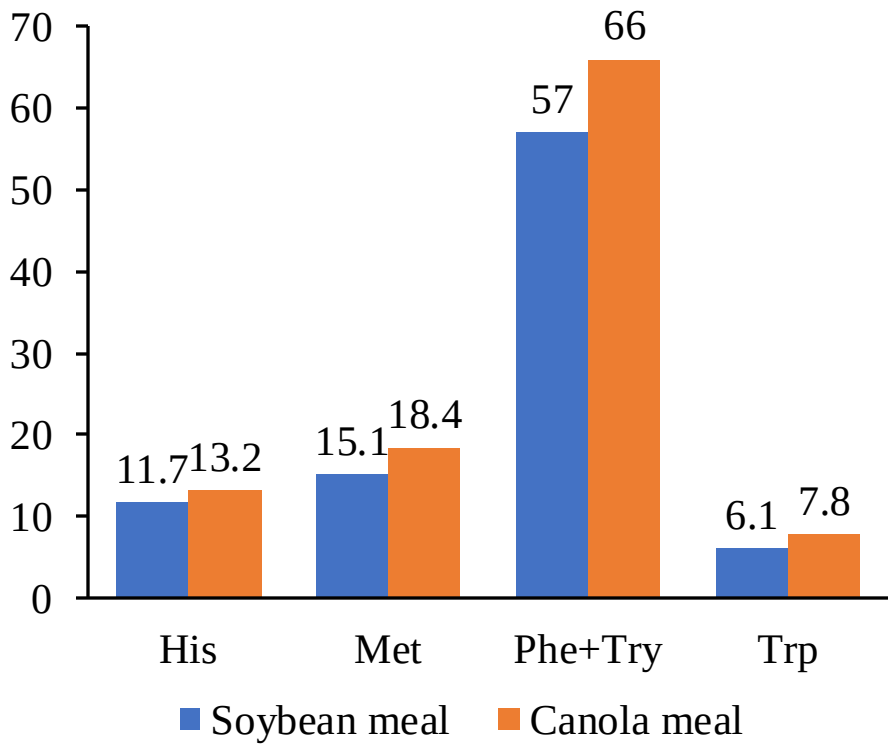
Feeding Soybean Meal (17 % diet DM) vs. Canola Meal (27 % diet DM)



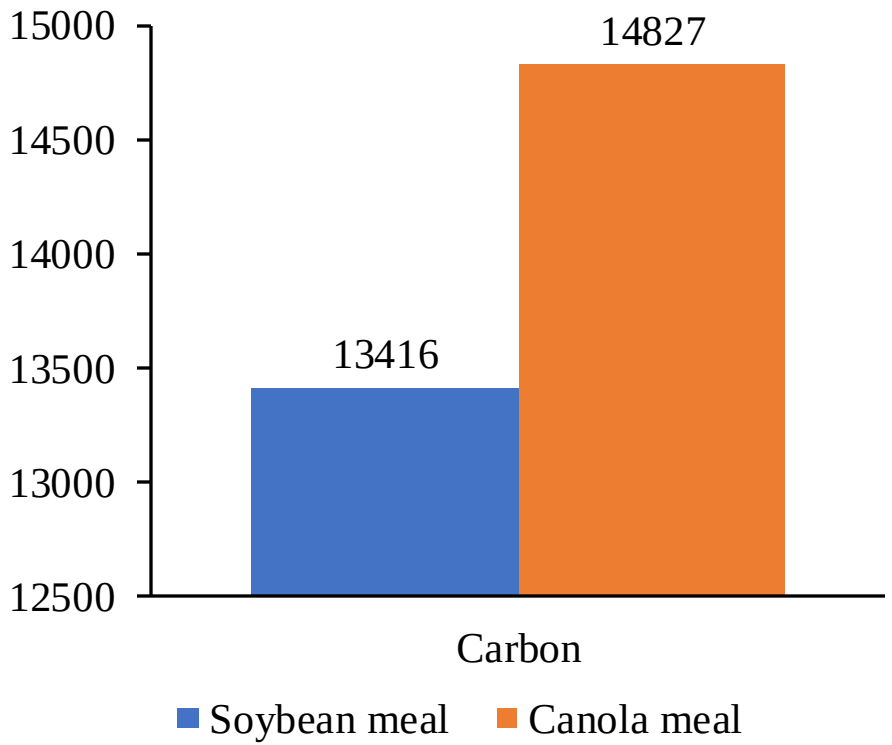
(Galindo et al., 2024)

Feeding Soybean Meal vs. Canola Meal: Net portal absorption (GI to portal vein), mmol/h

Group 2 amino acids (P = 0.10)



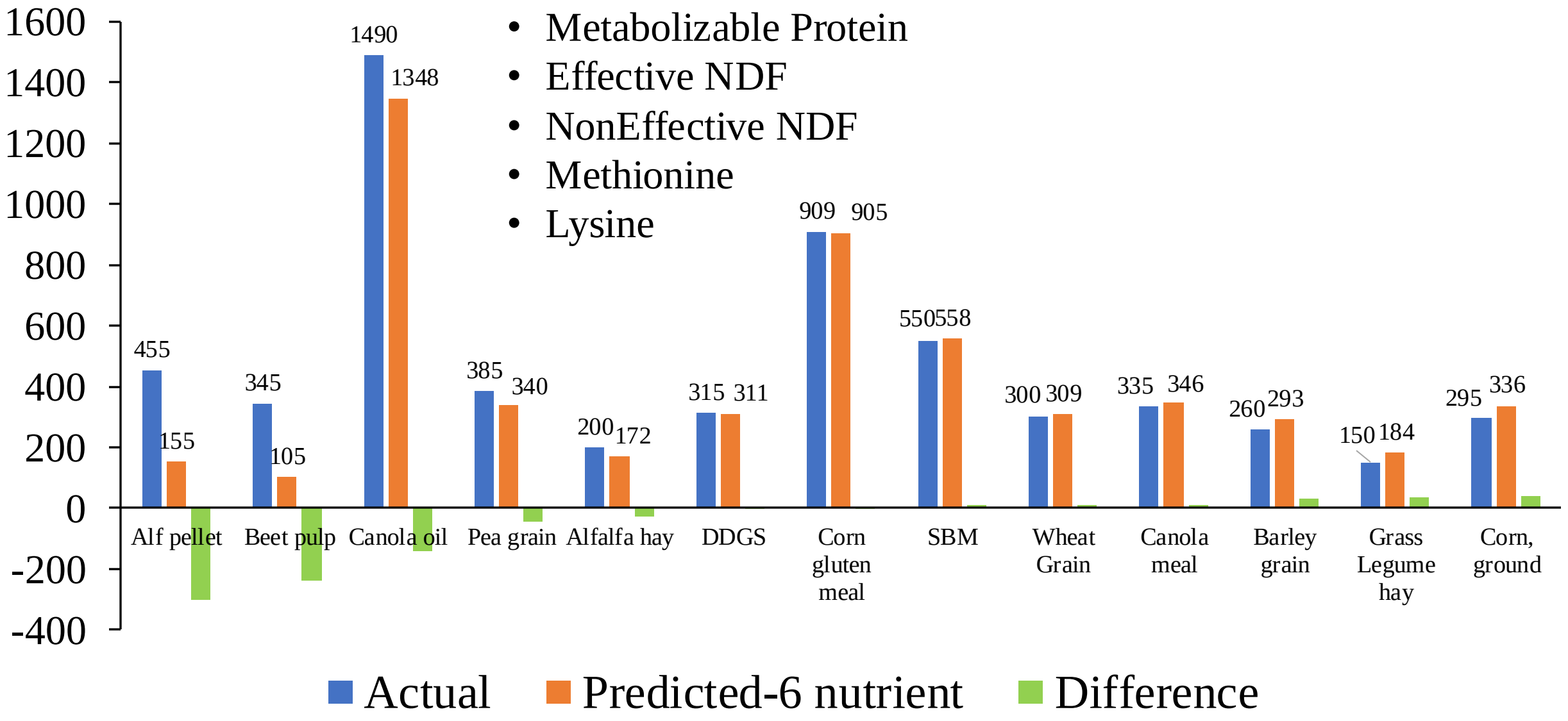
Energy yielding nutrients (P = 0.54)



(Galindo et al., 2024)

Nutrients used:

- Energy
- Metabolizable Protein
- Effective NDF
- NonEffective NDF
- Methionine
- Lysine



Feeding high protein feeds

Q2. What factors do you consider most important when selecting a high-protein feed

- ❑ Nutrient content/digestibility
- ❑ Consistency
- ❑ Past performance
- ❑ Cost availability

Feed Mixing

Q3. Do you always get the correct amount of feed in the mixer?

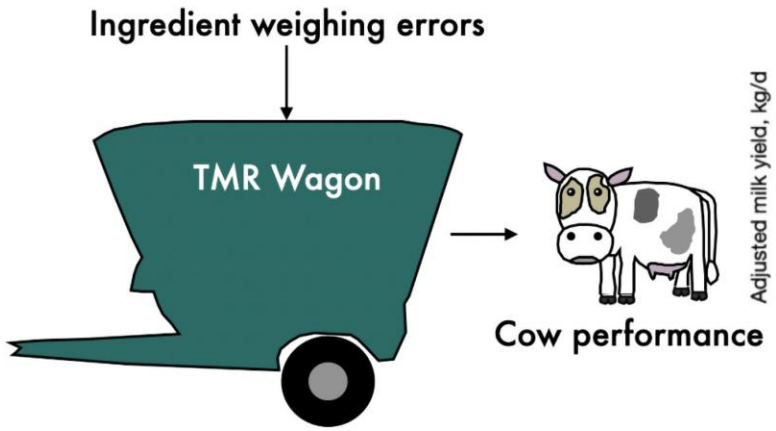
If not which feeds are you more likely to a)over feed and b) underfeed

JDS Communications®
2024; 5:102–106

https://doi.org/10.3168/jdsc.2023-0423
Short Communication
Animal Nutrition and Farm Systems

Back to basics: Precision while mixing total mixed rations and its impact on milking performance

Alex Bach[1,2*†]



Objective:

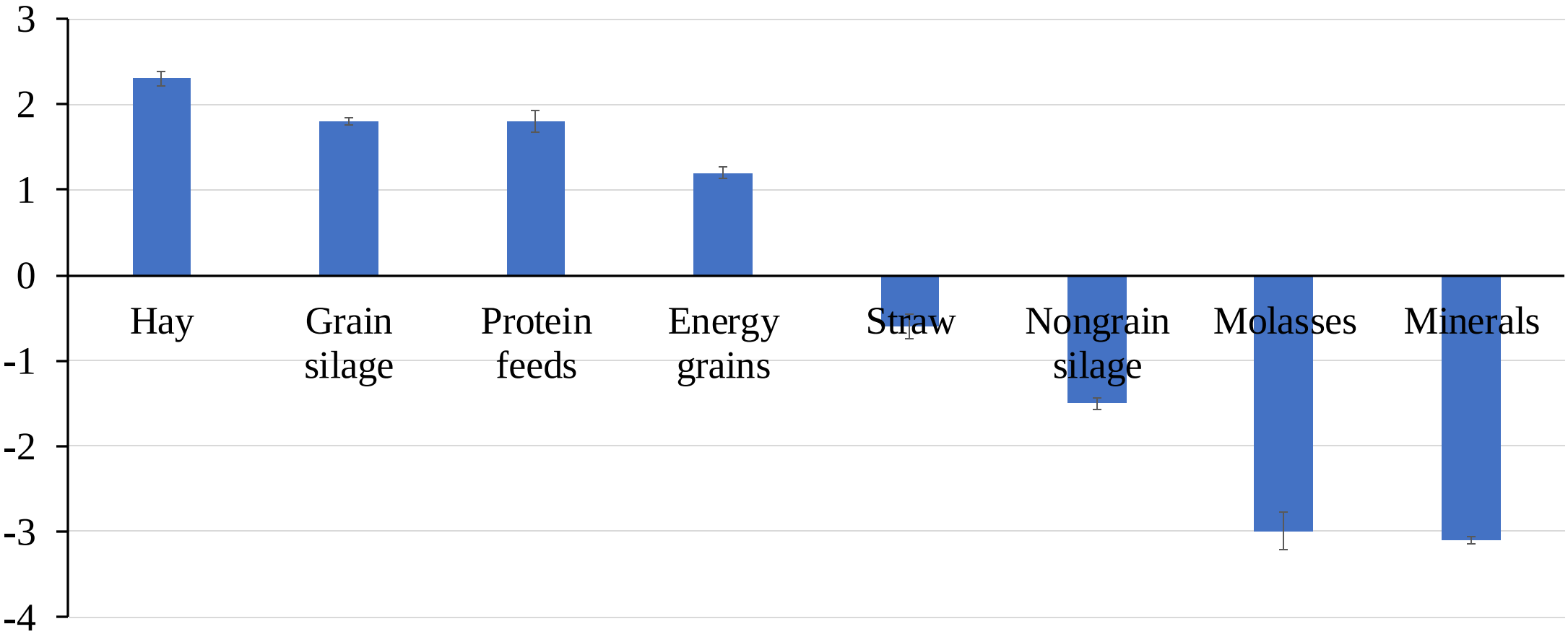
Evaluate if discrepancies between expected (theoretical) and actual TMR ingredient amounts impact milk yield.

Bach (2024)

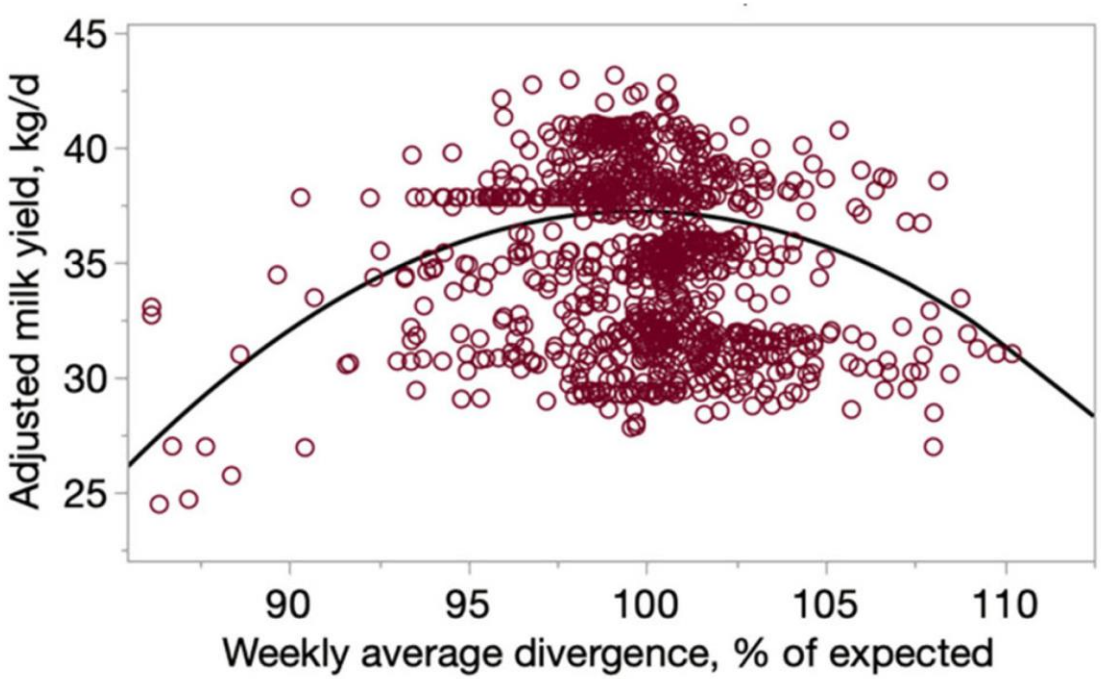
Study Overview:

- **Data:** 2-year retrospective study on 19,000 cows across 92 pens from 21 farms in Italy, Portugal, Spain, & the Netherlands.
- **Collection:** Daily records of milk production, days in milk (DIM), and ingredient amounts in rations.
- **Analysis:**
  - Calculated divergences (%) between expected vs. actual ingredient amounts.
  - Assessed impact on milk yield.

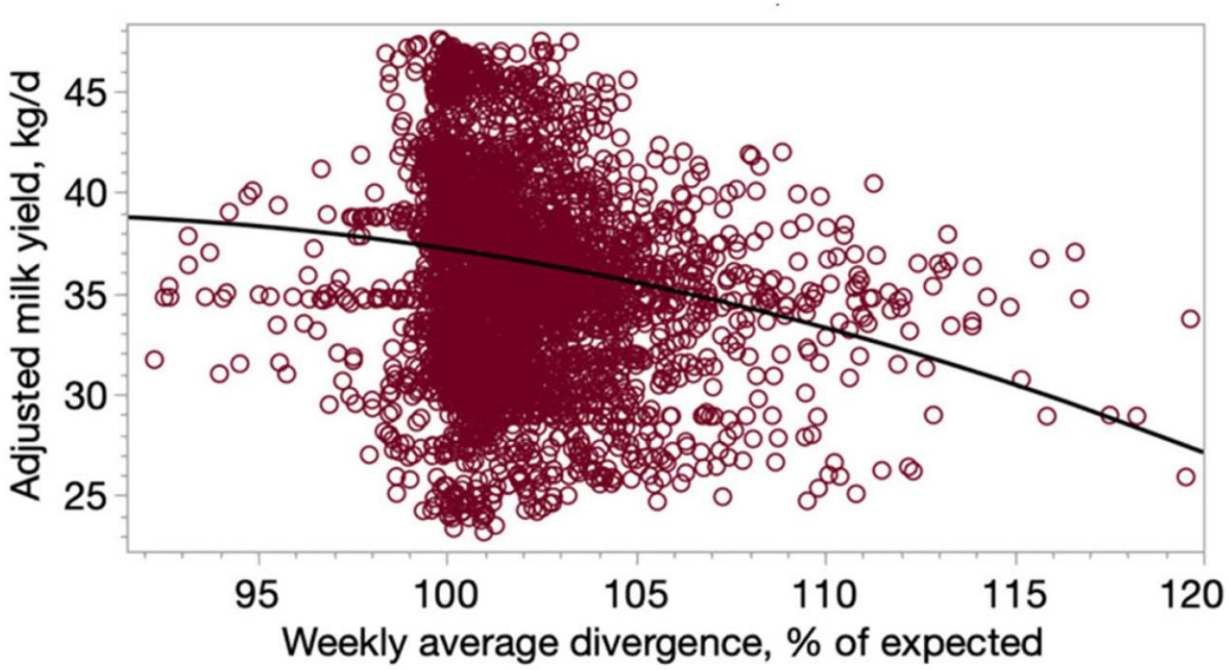
% Divergence by feed, mixed and delivered



(A) Grain silage (i.e. corn, oat)

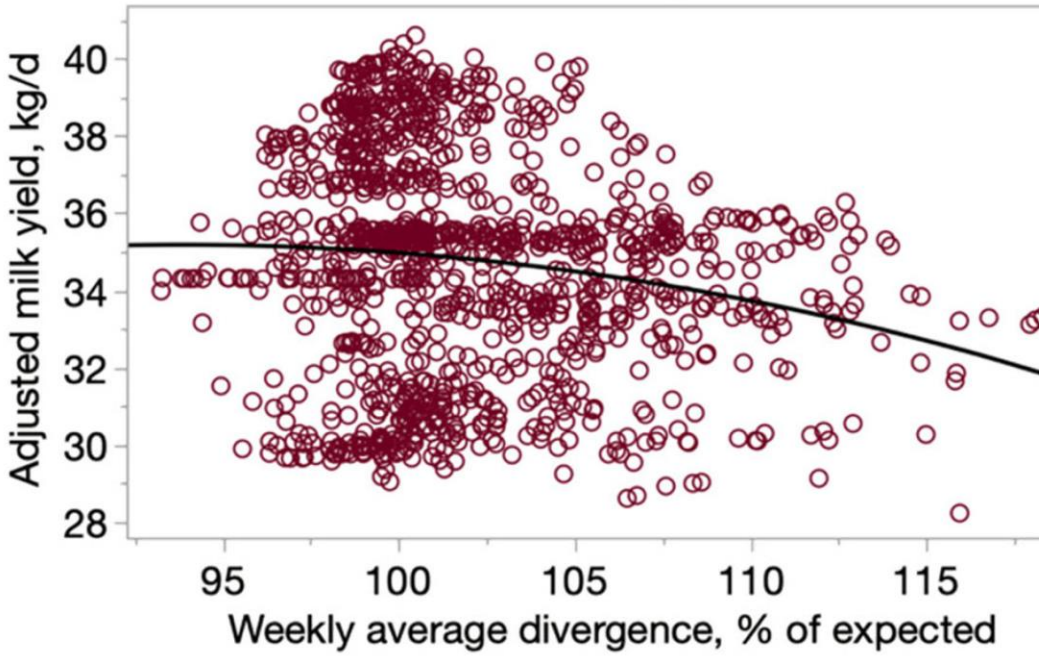


(B) Non-grain silage (ie. alfalfa ryegrass)



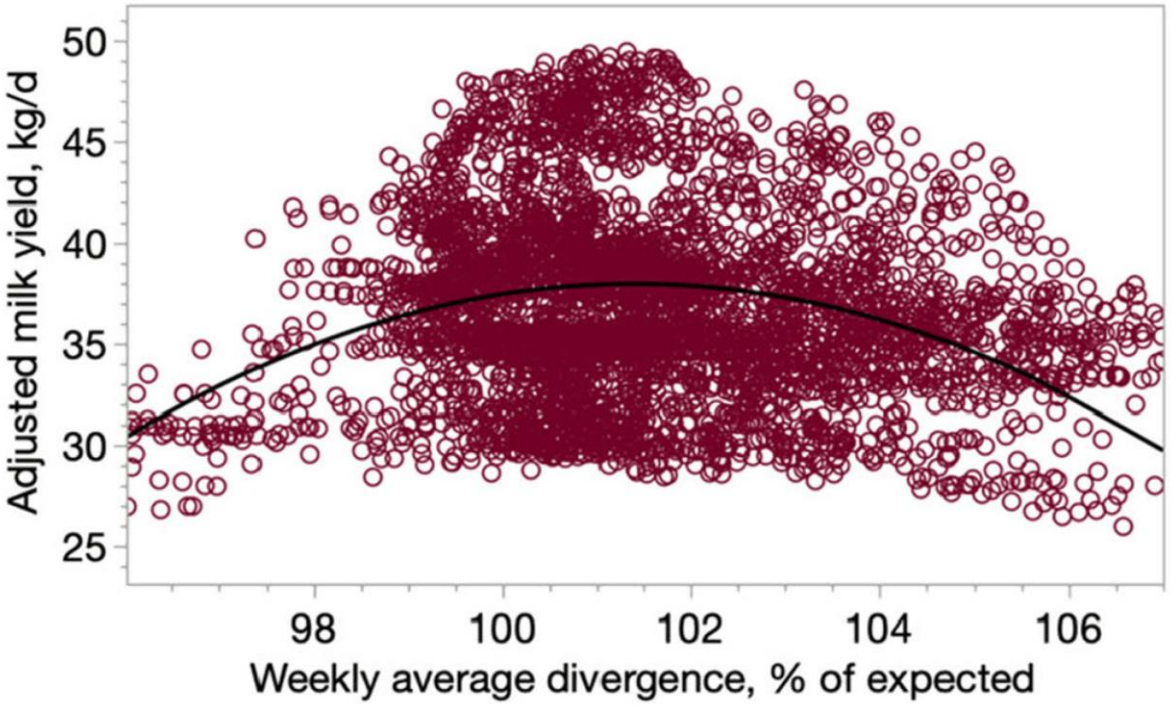
Protein sources (i.e. soybean meal, canola meal sunflower meal)

(C)



(A) TMR overall

(



Main findings:

1. **“Mix-delivery”**: Producers consistently mixed greater total amounts of TMR than what was dictated by the formulated ration, with an average divergence of 1.52% surplus.
2. **Ingredient-Specific Divergences**:
    - **Overmixed Ingredients**: Energy grains, grain silages, hays, and protein sources were mixed in excessive amounts.
    - **Undermixed Ingredients**: Nongrain silages, molasses, minerals, and straw were mixed in lower amounts than expected.

Variation in feed mixing procedures

JDS Communications®
2024; 5:548–552

https://doi.org/10.3168/jdsc.2024-0564
Short Communication
Animal Nutrition and Farm Systems

Estimation of the nutrient variation in feed delivery and effects on lactating dairy cattle

A. L. Carroll,[1] K. J. Hanford,[2] C. Abney-Schulte,[3] and P. J. Kononoff[1]*

Influence of the count of positive days on DMI (kg/d), milk yield (kg/d), and pregnancy rate (%)

Item	Average daily nutrient deviation (SEM)					Bayesian information criterion
	Intercept	Starch	Fat	NDF	Protein	
DMI (kg/d)	17.2 (1.78)	−0.0483 (0.01265)			0.0211 (0.009418)	275.3
Milk yield (kg/d)	31.4 (2.50)	0.0486 (0.02110)		−0.0298 (0.02202)		340.7
Pregnancy rate	21.7 (4.34)		0.385 (0.1635)		−0.420 (0.1879)	541.2

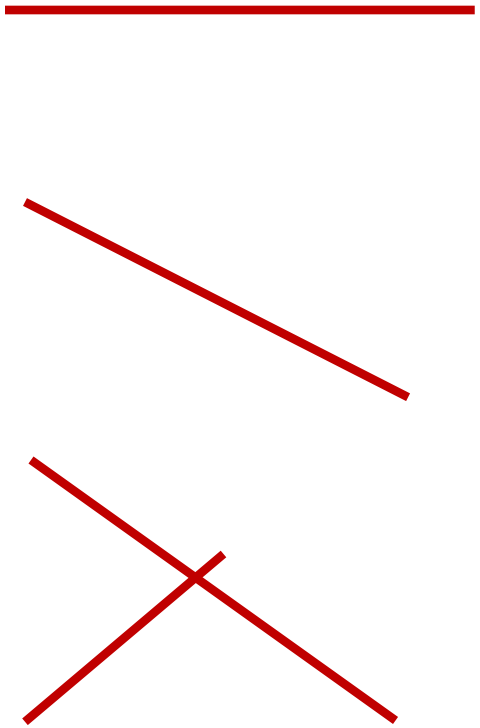
Oscillating changes in dry matter, what happens if I feed wet silage for a few days?

Treatments

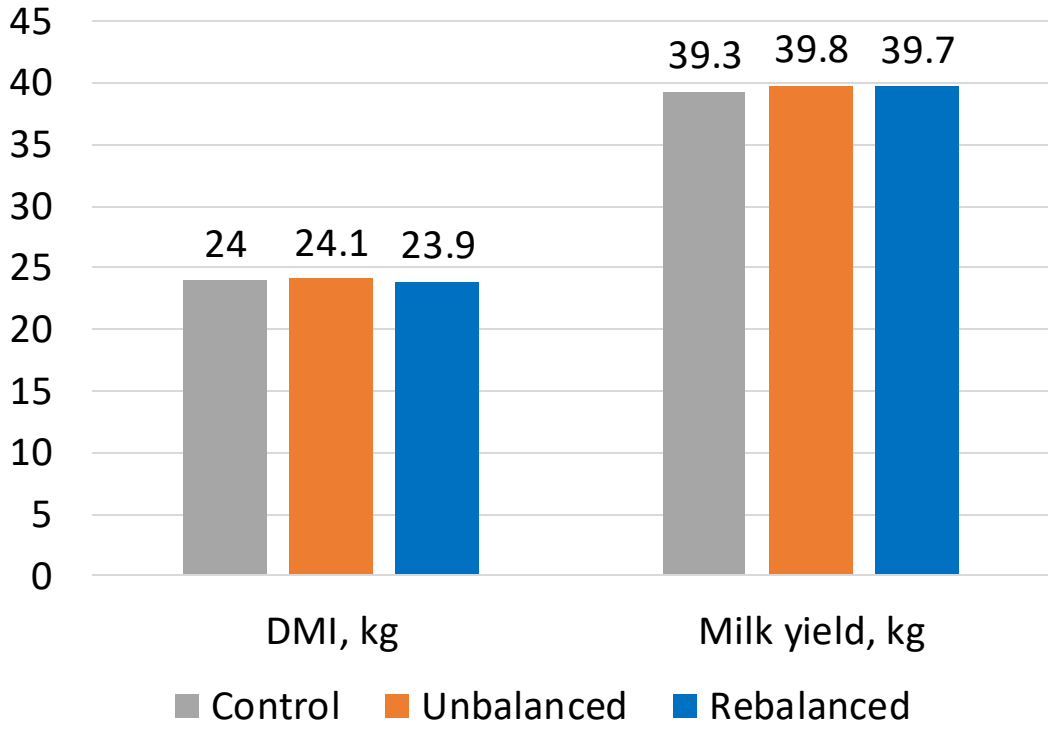
I. Control:
55:45 F:C for 21 d

II. Unbalanced:
Water added d3-5 and 12-14
AF basis: Same as control
DM basis: F:C (49:51),
LESS FORAGE DM!

III. Re-Balanced:
Corrected for change on DM basis

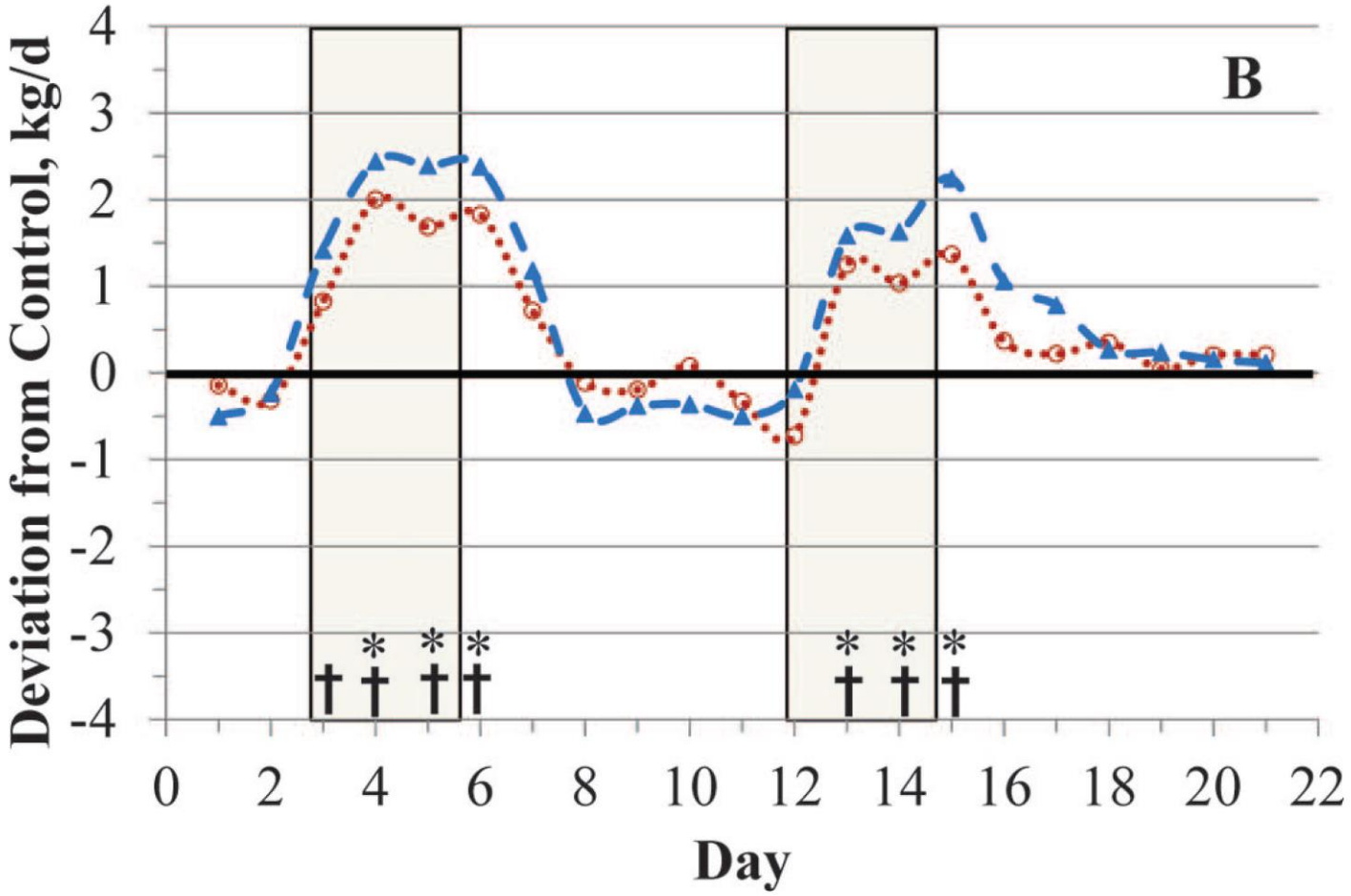


Effects on intake and production



McBeth et al., 2013; JDS 96: 3924-3935

As fed Intake, deviation from Control

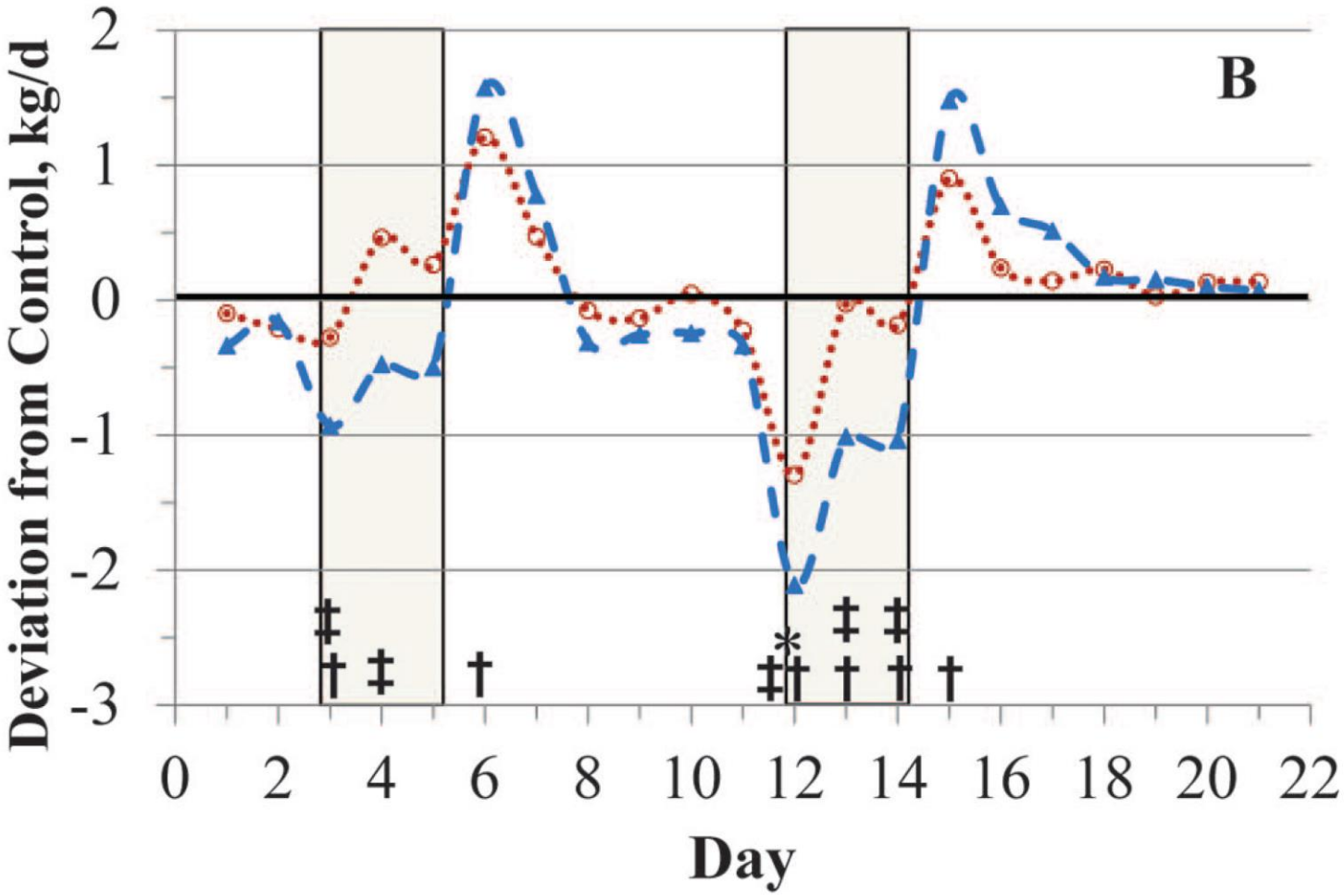


Unbalanced

Re-balanced

McBeth et al., 2013; JDS 96: 3924-3935

DM Intake, deviation from Control



Unbalanced

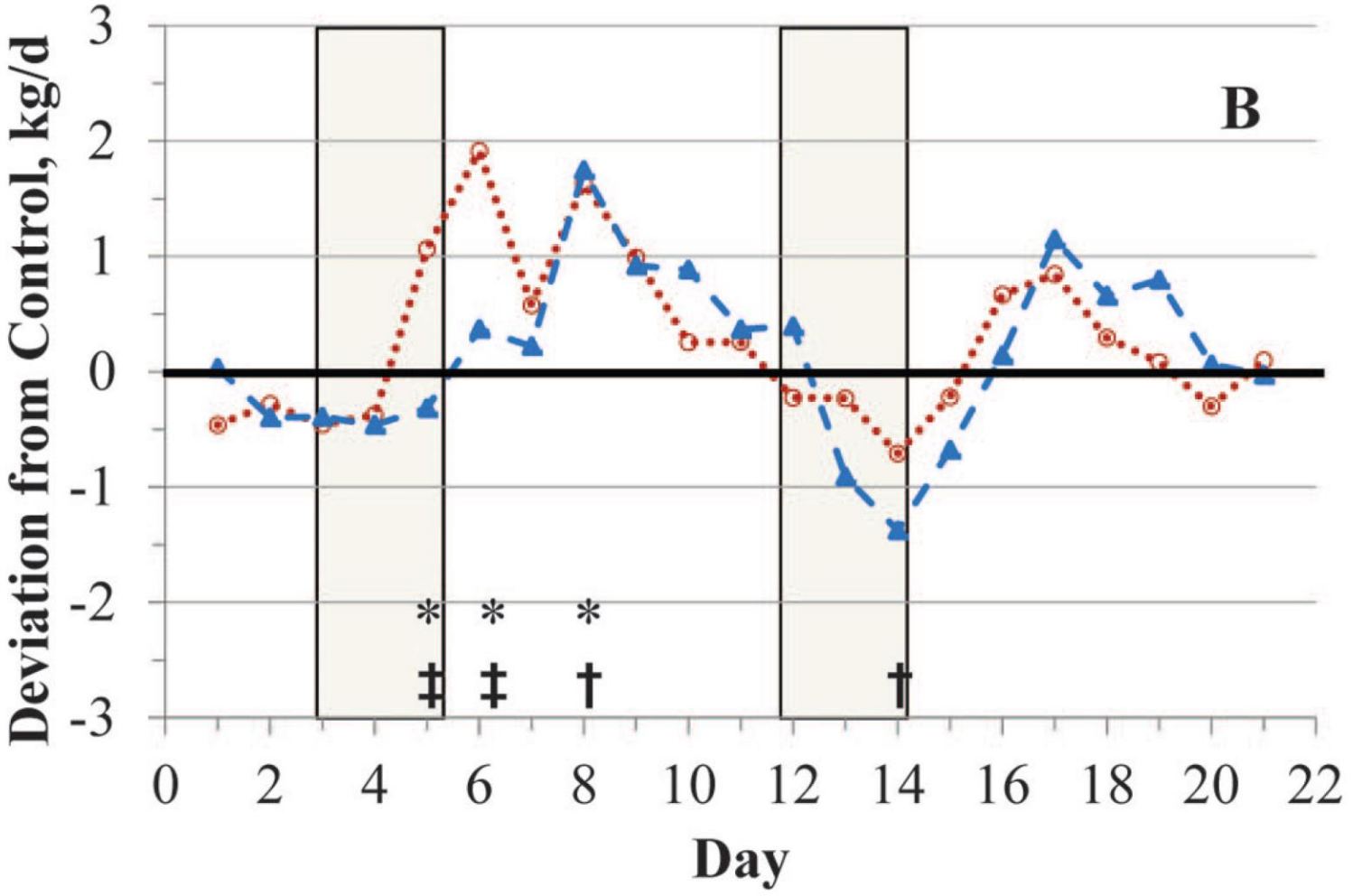
Re-balanced

Lesson: if feed is wet cows eat more so just feed more, continue to feed more for a few days until they recover.

Properly train feeders and adjust feeding rates for transient changes in silage dry matter.

McBeth et al., 2013; JDS 96: 3924-3935

Milk yield, deviation from Control



Unbalanced

Re-balanced

Lesson: lost a little milk during the wet phase and then gained it back.

McBeth et al., 2013; JDS 96: 3924-3935

Take home messages

- Improving digestible fiber means more milk
  - Emerging technologies have the potential to improve milk production.
- Feed like canola meal should be evaluated on
  - chemical composition
  - consistency
  - past experiences
  - cost
- Mixing affects production
  - Be careful not to overmix forages, energy grains and protein sources
  - Minerals are commonly undermixed
  - 1 d rain? Ensure cows have feed.