Got (More) Milk? The Latest Research on

Fueling Dairy Cows with High-Oleic Soybeans Adam L. Lock **Michigan State University**





F **Sources of Milk Fatty Acids** De novo synthesis 4500 × C4 to C14 4000 × Part of C16 3500 > Acetate 3000 B-hydroxybutyrate ₹ 2500 Milk 2000 Uptake of preformed fatty [문 1500 Mixed acids Preformed 1000 × Part of C16 500 × All long chain 0.00 1.00 2.00 3.00 4.00 Absorbed from digestive tract Milk Fat kg/d Neto et al. Lock Lab Data Set Mobilized from body fat

Increasing Precursor Supply Acetate & butyrate

- · Palmitic acid - Driver for initiating TAG synthesis in MG
- Preformed FA (18-carbon FA)
- Digestibility differences important - Not all 18-carbon FA are the same
- Consider oilseeds and PA/OA supplements over SA-enriched supplements

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- Impact of specific FA on nutrient partitioning and milk fat synthesis





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	Fat Supplements ¹			Oilseeds ¹			
Fatty Acid, g/100 g	Mix FA prill	C16:0- enriched prill	Ca-salt of palm fat	wcs	Conventional soybean	High C18:1 soybean	
C14:0	2.70	1.60	1.01	0.61	0.60	0.90	
C16:0	32.8	89.7	47.7	24.6	10.2	5.80	
C18:0	51.4	1.00	3.90	2.00	4.10	3.50	
C18:1 (n-9)	5.80	5.90	37.3	14.8	25.2	73.9	

8.25

56.5

48.2

6.10

World oil prices are rising and can affect availability and pricing of fat supplements

 Oilseeds are an area of interest

1.30

C18:2 (n-6)

0.80

¹Determined by GLC analysis in the Lock Lab.

5





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10





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	Treatment					
Ingredient, % DM	0%	8%	16%	24%		
Corn Silage	36.6	36.6	36.6	36.6		
Alfalfa Silage	9.82	9.82	9.82	9.82		
Ground Corn	18.1	18.1	18.1	18.1		
Vitamin and Mineral Mix	4.99	4.99	4.99	4.99		
Lactation Mix	4.83	4.83	4.83	4.83		
HOSB, Roasted and Ground	0.00	7.99	16.0	24.0		
Soybean Meal	18.3	12.3	6.32	0.42		
Soyhulls	7.32	5.32	3.33	1.25		
Nutrient Composition, % DM						
NDF	29.3	28.5	27.6	26.7		
Forage NDF	21.3	21.3	21.3	21.3		
СР	17.8	17.8	17.8	17.8		
Starch	27.0	27.2	27.4	27.6		
Total FA	2.57	3.60	4.63	5.66		

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Diet and Nutrient Composition							
	atment						
Ingredient, % DM	CON	RST	RAW-D	RAW-U			
Corn Silage	45.8	45.8	45.8	45.8			
Alfalfa Silage	8.2	8.2	8.2	8.2			
Ground Corn	11.1	11.1	11.1	11.1			
Vitamin and Mineral Mix	2.0	2.0	2.0	2.0			
High Cow Lactation Mix	4.1	4.1	4.1	4.1			
DCAD	0.4	0.4	0.4	0.4			
Roasted HOSB	0.0	16.0	0.0	0.0			
Raw HOSB	0.0	0.0	16.0	16.0			
Soybean Meal	18.2	6.3	6.3	0.0			
Soyhulls	10.2	6.0	6.0	6.0			
Heat-treated SBM	0.0	0.0	0.0	6.3			
Nutrient Composition, % DM							
NDF	29.2	27.4	27.2	27.5			
Forage NDF	19.4	19.3	18.9	19.0			
СР	24.9	24.9	24.5	24.6			
Starch	17.9	17.4	17.5	17.2			
Total FA	1.61	4.30	4.36	4.34			
igan State University			Bales and Lock. 20	24. J. Dairy Sci. 107			















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29





31











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High C18:1



5 Summary of 4 HOSB Studies (Difference from Control) **î 0.19 kg/d** 0.4 ■Study 1 Difference from control, kg/d 0.2 0.2 0.1 Study 2 Study 3 ■ Study 4 Study 3 - Combo Study 4 - Combo 0.12 0.27 01 0.0 Milk Fat



Fatty Acid, g/100 g	soybeans Expt 1	soybeans Expt 2	soybean expeller meal
C16:0	5.44	5.00	6.29
C18:0	3.40	3.37	2.68
C18:1 (n-9)	81.0	83.4	78.8
C18:2 (n-6)	3.51	4.78	7.86
C18:3 (n-3)	1.47	1.46	2.23
Total FA (% DM)	20.3	17.5	5.63





41





42

	Primiparous		Multiparous		CEN4	P values		
Variable	CON	HO oil	CON	HO oil	SEIVI	TRT	Par	TRTxPar
DMI, kg/d	24.5	24.6	30.5	30.2	0.33	0.81	0.01	0.47
Milk Yield kg/d								
Milk Yield	26.6	29	40.7	40.2	0.56	0.34	0.01	0.67
ECM	31.5	31.6	42.2	42.8	1.44	0.58	0.01	0.67
Milk Composition								
Fat, kg/d	1.12	1.15	1.51	1.55	0.05	0.20	0.01	0.73
Fat, %	3.86	4.05	3.82	3.95	0.20	<mark>0.07</mark>	0.41	0.46
Protein kg/d	0.95	0.94	1.23	1.26	0.02	0.66	0.01	0.47
Protein %	3.24	3.31	3.12	3.19	0.04	<mark>0.10</mark>	0.01	0.94
BCS	2.97	2.98	2.79	3.03	0.05	0.01	0.2	0.03
Fat depth, mm	4.97	5.34	4.79	5.29	0.20	0.03	0.54	0.75

45





50

6 **High Oleic Soybeans - Potential Benefits** Homegrown FA and protein source Good results achieved with 8 to 16% DM Ability to feed more rumen-available unsaturated FA Roasting adds value • Dynamics in the HOSB and oil markets may present · Can drive milk fat (and milk yield) opportunities when supply outpaces demand Source of oleic acid • Another option for crop rotation • Can replace other fat sources that provide 18-carbon Good replacement for FA (Ca-salts and mixed SFA prills) conventional beans/lower MFD risk Potentially more economical source of 18-carbon FA · Careful to avoid overconditioning cows – manage feeding level and other nutrients · Additive effect with palmitic acid · Additive effect with good rumen/fiber digestibility

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55

6

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> Contact Details: Dr Adam L. Lock Department of Animal Science Michigan State University allock@msu.edu 517-802-8124