

Supplementary Table

Table S1. Ingredient composition of treatment diets fed to lactating cows (% of DM)

Item	Treatment diets ¹			
	CON	LN	MN	HN
Soybean hull	0	0.83	1.67	2.50
Beet pulp pellet	0	0.84	1.66	2.50
Alfalfa hay	12.3	11.4	10.3	9.2
Oat hay	4.38	3.76	3.00	2.42
Whole corn silage	23.8	23.2	22.8	22.3
Alfalfa silage	2.60	2.60	2.60	2.60
Extruded soybean meal	2.03	2.03	2.07	2.09
Soybean meal	7.11	7.18	7.25	7.32
Steam-flaked corn	27.5	27.7	27.8	28.0
Double-low(low erucic acid, low glucosinolate) rapeseed meal	8.32	8.41	8.48	8.57
DDGS(distillers dried grains with soluble)	0.51	0.53	0.54	0.55
Whole cotton seed	4.17	4.31	4.45	4.58
Wheat bran	1.07	1.09	1.10	1.11
Mineral-vitamin premix ²	4.02	4.06	4.10	4.14
Fatty acid calcium ³	0.62	0.60	0.60	0.58
Fatty powder ⁴	0.93	0.90	0.90	0.89
Wet cane molasses	0.66	0.67	0.69	0.71

¹CON (control, no by-products); low by-products (1.67%) (LB: 0.83% SH + 0.84% BP); medium by-products (3.33%) (MB: 1.67% SH + 1.66% BP), and high by-products (5%) (HB: 2.5% SH + 2.5% BP) (DM basis).

²The premix for lactating cows contained (per kilogram of DM): 150,000 IU Vitamin A, 35,000 IU Vitamin D, 2,000 IU Vitamin E, 250 mg Cu, 500 mg Mn, 1,000 mg Zn, 20 mg Se, 40 mg I, 25 mg Co.

³Fatty acid calcium contained $\geq 82.5\%$ ether extract, $\geq 8\%$ Ca and $\leq 10\%$ ash.

⁴ Fatty powder contained $\geq 99.5\%$ ether extract.