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Agroscope

Feeding zero concentrate to dairy cows

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Introduction

- Distribution of potential “foods” to ruminants is under criticism
- Reduce reliance of human-edible foods (Wilkinson 2011, Ertl *et al.*, 2016)
- Organic farming in Switzerland
 - Actually limited at 10% concentrate of annual ration
 - In future 5% and even 0% concentrate
- Only moderate effects of concentrate reduction on milk yield, health and fertility (Ivemeyer *et al.*, 2014, Leiber *et al.*, 2017)
 - Improvements of management
 - Modest reduction of concentrate on average
- Goal
 - Investigate two contrasting treatments (0 & 750 kg conc. per lactation)
 - Simultaneously and over whole lactation



Material and Methods (1)

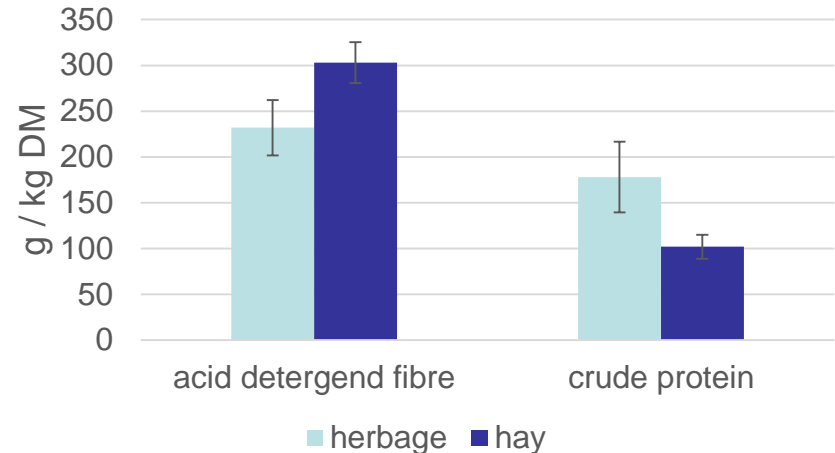
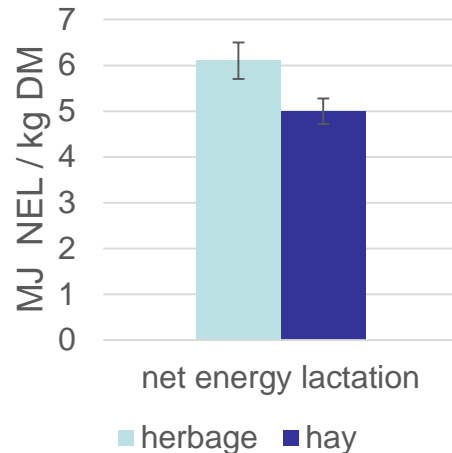
- Organic farm (Ferme Ecole de Sorens, Switzerland, pastures 800 – 900 m a.s.l.)
- Three-year study started January 2015
- First two years a total of 50 Holstein cow pairs
 - 2/3 of Swiss origin
 - 1/3 of New Zealand origin

- Treatments
 - 0 kg concentrate per lactation
 - 750 kg concentrate per lactation
 - protein-rich concentrate only during the winter feeding
 - energy-rich concentrate during the whole year.



Material and Methods (2)

- Supplementation scheme for 750 kg
 - to 100 days in milk (DIM): 4.5 kg concentrate / d
 - 100 to 200 DIM: 2.5 kg concentrate / d
 - 200 to 300 DIM: 1 kg concentrate / d
- Concentrate consumed 746 kg (22 SD)
 - 653 kg (39 SD) of energy-rich concentrate
 - 93 kg (37 SD) of protein-rich concentrate
- Forage





Results: milk yield

	0 kg		750 kg		sd	P		
	CH	NZ	CH	NZ		CON	COW	INT
Milk [kg]	5697	4940	6539	5517	902	***	***	-
ECM [kg]	5670	5287	6461	6028	873	***	*	-
Milk fat [kg]	236	224	267	251	40	***	-	-
Milk protein [kg]	182	173	208	199	28	***	-	-
Lactose [kg]	264	231	303	259	40	***	***	-

CH: Swiss Holstein, NZ: New Zealand Holstein, sd: standard deviation, CON: concentrate, COW: cow type, INT: interaction, ECM energy-corrected milk, ***: $P < 0.001$, **: $P < 0.01$, *: $P < 0.05$, t: $P < 0.1$

Effect of an additional kg of concentrate

	CH	NZ
Milk per concentrate [kg/ kg]	1.1	0.8
ECM per concentrate [kg/kg]	1.1	1.0

Results: milk content and cell counts

	0 kg		750 kg		sd	P		
	CH	NZ	CH	NZ		CON	COW	INT
Milk fat [%]	4.15	4.56	4.10	4.55	0.36	-	***	-
Milk protein [%]	3.19	3.52	3.20	3.61	0.19	-	***	-
Lactose [%]	4.64	4.69	4.64	4.70	0.15	-	t	-
Milk urea [mg/dl]	23	23	22	22	3	-	-	-
SCC [\log_{10}/ml]	4.98	4.95	4.94	5.06	0.31	-	-	-

CH: Swiss Holstein, NZ: New Zealand Holstein, sd: standard deviation, CON: concentrate, COW: cow type, INT: interaction, SCC: somatic cell counts, ***: $P < 0.001$, **: $P < 0.01$, *: $P < 0.05$, t: $P < 0.1$

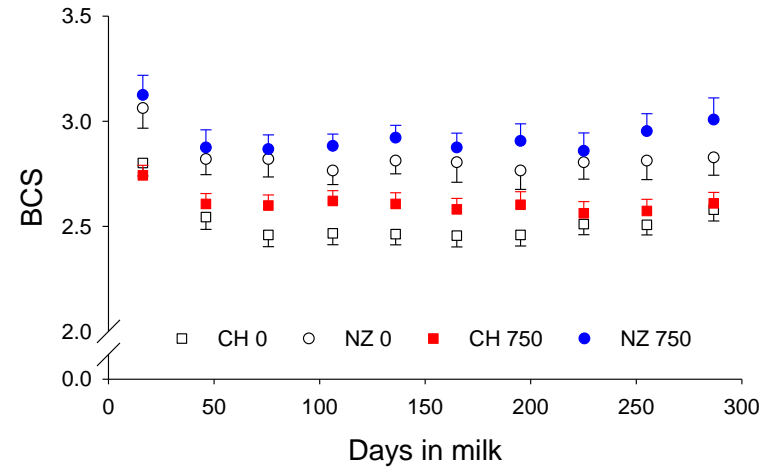
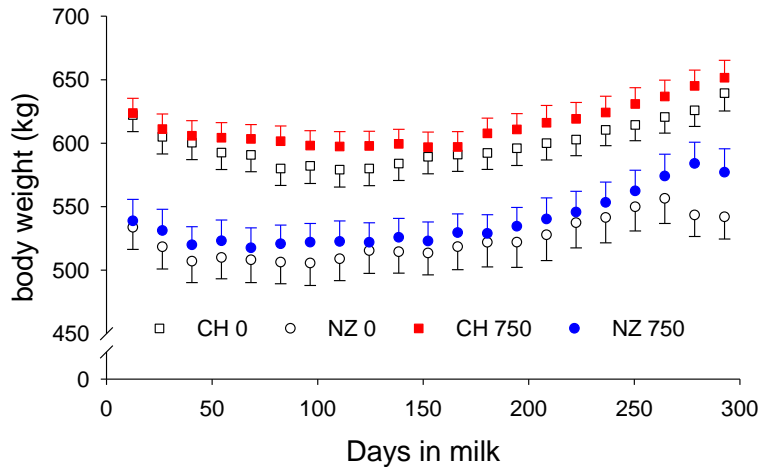




Results: body weight and BCS

	0 kg		750 kg		sd	P		
	CH	NZ	CH	NZ		CON	COW	INT
Body weight [kg]	602	526	615	539	69	-	***	-
BCS	2.53	2.84	2.61	2.94	0.27	-	***	-
ECMBW [kg/kg]	9.4	10.1	10.5	11.2	1.1	***	**	-
ECMBW ^{0.75} [kg/kg]	46.6	48.2	52.4	53.9	5.4	***	-	-

CH: Swiss Holstein, NZ: New Zealand Holstein, sd: standard deviation, CON: concentrate, COW: cow type, INT: interaction, BCS: body condition score, ECM: energy-corrected milk, BW: body weight, BW^{0.75}: metabolic body weight, ***: $P < 0.001$, **: $P < 0.01$, *: $P < 0.05$, t: $P < 0.1$





Conclusions (based on results of 2 years)

- The omission of concentrate supplementation resulted in reduced milk and energy-corrected milk yields.
- No differences occurred in relation to milk fat, milk protein and urea concentration.
- There were no differences in somatic cell counts between supplemented and non-supplemented dairy cows.



Conclusions (based on results of 2 years)

- The averaged body weight and BCS were not significantly affected by the concentrate supplementation.
- The milk production response to concentrate supplementation and the BCS might give indications about the suitability of cow types in relation to the feeding systems.



Thank you for your attention!

