

## Ensiled high moisture barley or dry barley in the grass silage-based diet of dairy cows

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**Introduction** Ensiling high moisture grain is based on a procedure similar to ensiling grass. Soluble carbohydrates of grain are partly fermented into acids and some protein is degraded. Thus the nutritional quality is modified by the preservation method. Two trials were conducted to compare the effects of dry barley (DB) and ensiled barley (EB) in a total mixed ration (TMR) on feed intake and milk production of dairy cows.

**Materials and methods** Sixteen cows were used in both replicated (n=4) Latin square experiments with four 21 day periods and a 2 x 2 factorial arrangement of treatments to evaluate the effects of barley preservation method and protein supplementation. EB was combine harvested at an earlier stage of maturity (dry matter (DM) 560 g/kg) and DB at full maturity (782 g DM/kg) from the same field. EB grains were rolled in a crimper (Murska 350 S2, Aimo Kortteen Konepaja Oy) and treated with a formic acid additive (3.3 l/t, AIV2000, Kemira Oyj), and then stored in a bunker silo and sealed beneath plastic sheeting. DB was dried to the final DM content of 890 g/kg. Timothy-meadow fescue grass was wilted, harvested with precision chopper, treated with formic acid additive (AIV2000, 5 l/t) and ensiled in bunker silos. Experimental treatments consisted of two TMRs (including ensiled or dry barley) offered *ad libitum* and supplemented with two levels of extra rapeseed meal (RSM) fed during milking. On DM basis TMR contained 55% grass silage and 45% concentrate, which included 64% barley, 22.5% RSM, 10.5% molassed sugar beet pulp (SBP) and 3% minerals. The crude protein content of concentrate and silage were 173 and 129 g/kg DM, respectively. The extra RSM levels were 0 or 1 kg/d (Trial 1) and 0 or 2 kg/d (Trial 2) fed as a mixture of RSM and SBP (3:1).

**Results** The fermentation quality of EB was good as indicated by low pH (3.86), ammonia-N (33 g/kg N) and VFA (11 g/kg DM) content. Similarly the quality of grass silage was good with low pH (4.03), ammonia-N (45 g/kg N) and VFA (25 g/kg DM) content. Lactic acid content in EB and grass silage was 40 and 59 g/kg DM, respectively. The preservation method of barley did not affect TMR intake in Trial 1 (Table 1). In Trial 2, daily intake of DB diet was higher than the intake of EB diet. No significant differences were observed between EB and DB diet in milk yield or milk composition in Trials 1 and 2. RSM supplementation decreased the intake of TMR but increased total DM intake with 0.75 (Trials 1) and 1.20 kg DM/d (Trial 2). In both experiments, RSM supplementation increased milk and energy corrected milk (ECM) yield, the response being 0.85 kg ECM/kg RSM. No significant effects of RSM on milk composition were observed. The effects of extra RSM on feed intake and milk production were the same with EB and DB diets except on milk protein content in Trial 2 (interaction barley x RSM,  $P<0.05$ ).

**Table 1** Effect of ensiled or dry barley and rape seed meal (RSM) on feed intake and milk production

Barley	Dry		Ensiled		SEM	Barley	RSM
Trial 1: RSM (kg/d)	0	1	0	1			
DM intake (kg/d)	22.8	23.2	22.5	23.6	0.21		
Milk (kg/d)	30.1	31.3	30.3	30.8	0.29		*
Fat (g/kg)	43.1	43.3	43.8	43.1	0.72		
Protein (g/kg)	33.9	34.0	33.6	34.2	0.24		
Lactose (g/kg)	47.9	48.1	48.1	48.2	0.30		
Milk N/feed N	0.290	0.283	0.298	0.277	0.0048		*
Trial 2: RSM (kg/d)	0	2	0	2			
DM intake (kg/d)	22.6	23.6	21.4	22.8	0.19	***	
Milk (kg/d)	32.6	34.5	31.8	34.1	0.31		***
Fat (g/kg)	43.0	42.2	44.4	42.8	0.63		
Protein (g/kg)	32.4	31.6	31.8	32.1	0.18		
Lactose (g/kg)	49.4	49.2	48.8	49.2	0.17		
Milk N/feed N	0.303	0.273	0.313	0.288	0.0035	**	***

\*  $P<0.05$ , \*\*  $P<0.01$ , \*\*\*  $P<0.001$

**Conclusions** The results suggest that ensiled, crimped barley has the same nutritive value as dry barley when fed for dairy cows given grass silage-based diet.