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## The effect of chop length and additive on silage intake and milk production in cows

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**Introduction** Effects of reduced silage chop length on silage intake and milk production by dairy cows have been variable. Chopping of grass at harvest generally improves silage fermentation quality and consequently intake. The objective of this study was to assess the effect of chopping flail harvested silage ensiled with acid or biological additive prior to feeding on intake, milk yield and milk composition in dairy cows.

**Materials and methods** Eight Ayrshire cows were used in two 4 x 4 Latin squares, one with cows in their first lactation and one with cows in their 2<sup>nd</sup>–4<sup>th</sup> lactation. Silages were made directly cut with a flail-harvester from the 2<sup>nd</sup> cut of meadow fescue-cocksfoot-timothy grass using either lactic acid bacteria + cellulase enzyme (Biol) or formic acid-based (Acid = 800 g/kg formic acid + 20 g/kg orthophosphoric acid, 5 l/t) additive. Silages were made in bunker silos and stored about 3 months before the feeding experiment started. Silages were fed *ad libitum* unchopped or chopped with a precision chopper prior to feeding. Experimental treatments were: unchopped flail-harvested Biol silage (Flail/Biol), precision chopped Biol silage (Precis/Biol), unchopped flail-harvested Acid silage (Flail/Acid) and precision chopped Acid silage (Precis/Acid). The mean chop length of Flail-silages was 13.5 cm and that of Precis-silages 6 cm. A concentrate mixture of barley-oats-rapeseed meal-minerals (40.5-40.5-15-4 g/kg) was given 8 kg/d. Digestibility of feeds was determined with four wether sheep and used to calculate metabolisable energy (ME). Data were analysed statistically using the SAS GLM procedure. Square, animal, period and treatment effects and square\*period and square\*treatment interactions were used in the model, and the sums of squares for the treatment effects were further divided into contrasts.

**Results** Chemical composition of silages is presented in Table 1. Fermentation quality of both silages was good. Biol silage had lower pH and sugar content and higher fermentation acid and ammonia contents than Acid silage. Silage chop length had no significant effect on silage intake while the intake of Acid silages was higher than that of Biol silages. Chop length had only minor and insignificant effect on milk yield but additive had a more prominent effect Acid silage treatments produced a higher yield than Biol silage treatments, apparently because of differences in silage intake between additive treatments. Chop length had no clear-cut effect on fat, protein or lactose content of milk. The same was true for additive, except a higher fat content of milk in Acid than Biol silage treatments. Milk energy output (MJ/d) per metabolisable energy intake (MJ/d) and efficiency of utilisation of dietary crude protein for milk protein production was better with precision chopped silage than with flail harvested silage. Biol silage tended to increase feed energy conversion to milk energy compared with Acid silage

**Table 1** Chemical composition and fermentation quality of silages (dry matter g/kg, others g/kg DM)

Additive	Dry matter	Ash	Crude protein	Neutral detergent fibre	Acid fibre	pH	Sugar	Lactic acid	Acetic acid	Prop. acid	Butyr acid	NH <sub>4</sub> -N g/kg N
Biol silage	225	101	148	511	290	4.09	38	91	20	1.0	1.5	69
Acid silage	227	99	144	535	313	4.12	78	39	11	0.0	0.1	36

**Table 2** The effect of chop length and silage additive on silage intake, milk yield and milk composition in cows

Chopper/ Additive	Intake		Yield				Milk composition			Utilisation		
	Silage	Conc.	Milk	ECM	Fat	Prot.	Lact.	Fat	Prot.	Lact.	Milk E/ Feed E	Milk N/ Feed N
	kg/d		g/d				g/kg					
Flail / Biol	10.2	7.1	20.5	21.4	896	658	992	44.1	32.3	48.4	0.341	0.243
Precis / Biol	10.0	7.0	20.5	21.6	913	661	999	44.8	32.4	48.8	0.360	0.247
Flail / Acid	11.5	7.0	21.0	22.4	953	680	1024	45.5	32.4	48.7	0.332	0.239
Precis /Acid	11.4	7.0	21.3	23.0	984	698	1038	46.3	32.8	48.6	0.348	0.247
SEM	0.29	0.03	0.31	0.31	15.6	9.6	16.4	0.67	0.30	0.19	0.005	0.003
Flail vs Precis	NS		NS	NS	NS	NS	NS	NS	NS	NS	**	*
Biol vs Acid	***		*	**	**	*	*	*	NS	NS	P=0.08	NS

Significance: NS = non significant, \*  $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\*  $P < 0.001$

**Conclusions** Chopping of silage prior to feeding, when fermentation quality was similar had no effect on intake or milk yield and milk composition but utilisation of feed energy and protein were better with precision-chopped silage. Restriction of silage fermentation with formic acid compared with stimulation with lactic acid bacteria + cellulase enzyme additive increased silage intake and milk production.