Effects of species, maturity and additive on the feed quality of whole crop cereal silage

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Introduction Chemical composition of whole crop cereals differ among species and maturity stages. These chemical differences create variations in silage quality (Bergen *et al.*, 1991). There is only limited information available on the effects of plant species and maturity on the use of additives for whole crop cereal silage. The objective of this experiment was to determine the effects of species, maturity, additive and their interactions on nutrient composition and fermentation characteristics of whole crop cereal silage.

Materials and methods Triticale, barley, spring wheat and oats were harvested as direct cut at early milk stage (73) and at early dough stage of maturity (83; Zadoks *et al.*, 1974) in 2002 and 2003. Material was ensiled for 100 d in 4-l silos with or without the use of additive. The additives were Proens™ (4 l/t of 2/3 formic acid and 1/3 propionic acid; Perstorp AB, Perstorp, Sweden) and Lactisil 200® NB (200 000 cfu of *Lactobacillus plantarum, Enterococcus faecium, Pediococcus acidilactici* and *Lactococcus lactis*/g fresh herbage plus cellulase and sodium benzoate; Medipharm AB, Kågeröd, Sweden). The experiment was conducted as a split-split-split-plot with three field replicates per year. Because most variables had no significant interactions with year, data are presented as averages across years.

Results Delayed harvest increased dry-matter (DM) (from 286 to 373 g/kg) and starch concentrations (from 32 to 192 g/kg DM) but decreased sugar (from 194 to 93 g/kg DM) and fibre (NDF) (from 563 to 495 g/kg DM) concentrations as well as *in situ* rumen degradability of NDF (from 65 to 57%). Triticale had the highest sugar content but the lowest starch content. Oats had the lowest sugar content and barley had the highest starch content. Barley and triticale had higher starch + sugar content (281 vs 222 g/kg DM), lower NDF content (511 vs 547 g/kg DM) and higher rumen degradability of NDF (66 vs 56%), resulting in higher organic matter digestibility in barley and triticale than in oats and wheat (79 vs 68%). Silage fermentation characteristics were improved by use of additives (Table 1). In contrast to inoculant treatment, acid treatment restricted fermentation and resulted in higher sugar concentration in the silage than in fresh material (174 vs 144 g/kg DM). The higher lactic acid concentration in inoculated silage resulted in the lowest pH (4.1 vs 4.2 (control) and 4.4 (acid)). Ammonia-nitrogen concentration was only slightly higher in acid-treated silage than in fresh material (105 vs 97 g/kg total nitrogen). Inoculated silage had less protein degradation than the control (135 vs 163 g NH_3-N/kg total N).

Table 1 Fermentation characteristics of whole-crop cereal silages averaged over two maturities and two years

Herbage treatment	Plant Species				Significance	
(g/kg dry matter)	Barley	Triticale	Oats	Spring wheat	*P*	s.e.m.
Sugar						
Control	33	66	22	50	<0.0001	4.1
Inoculant	85	138	37	88		
Acid	196	189	122	189		
Lactic acid						
Control	69	62	73	41	<0.0001	3.1
Inoculant	81	87	67	57		
Acid	17	28	26	4		
Acetic acid						
Control	20	24	11	14	<0.0001	0.8
Inoculant	7	8	6	5		
Acid	3	12	3	2		

Conclusions Barley and triticale have higher nutritive value and more available carbohydrates for ensiling than oats and spring wheat. Use of additives improved silage quality.

References

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