Use of Silage Additives in Ensiling of Whole-Crop Barley and Wheat - A Comparison of Round Big Bales and Precision Chopped Silages

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Use of silage additives in ensiling of whole-crop barley and wheat - A comparison of round big bales and precision chopped silages

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Introduction An increasing use of whole-crop cereals, as supplementary feed, has increased interest in development of efficient ways of preserving these forages to achieve a high hygienic quality. It is known that ensiling of whole-cereals often results in silages with high concentrations of butyric acid (Weissbach & Haacker, 1988). Furthermore, problems with poor aerobic stability still persist despite the use of lactic acid bacteria (Filya *et al.*, 2000). Therefore, the objective of this study was to examine the effect of different types of additive mixtures on the fermentation process and aerobic stability of precision chopped and baled silages.

Materials and methods A spring variety of barley and autumn variety of wheat were harvested at the dough stage (42% DM). The crops were baled and wrapped with 12 layers of stretch film of white colour (width of 750 mm and thickness of 0.025 mm) or chopped to the particle size of 2 cm (4.5 l PVC silo). The following silage additives were used: C:control; KU:12% nitrite, 8% hexamine, 15.5% Na-benzoate, 5.5% Na-propionate; P1:42.5% formic acid, 20.5% propionic acid, ammonia; P2:22.4% formic acid, 41% propionic acid, ammonia; LAB1:lactic acid bacteria $5*10^5$cfu/g, saccharose; LAB2:lactic acid bacteria $5*10^5$cfu/g, cellulase 6500 IU/g, 7% Na-benzoate. The additives were applied at the dose of 4 l/t fresh forage. Each treatment included 3 replicates.

Results Additive treatments increased fermentation rate in both chopped silages, resulting in a significant pH drop compared with controls (Table 1). Butyric acid concentration was decreased by application of silage additives in both chopped silages as a consequence of restriction of clostridial growth. However, ensiling characteristics of chopped-barley silages were not reflected in the aerobic stability in contrast to chopped-wheat silages. Treatments LAB1 and LAB2 increased the fermentation rate in both barley and wheat bales, but only LAB2 silages had an enhanced aerobic stability. Treatments P1 and P2 improved the stability of wheat bales, although pH was significantly lower only in treatment P1. DM losses in all additive treatments were significantly reduced.

Table 1 Ensiling characteristics of barley and wheat silages. The stability was expressed as the number of days in ventilated silages until the CO_2 concentration in the out-going air reached 1% level

Forage			Treatment						$LSD_{0.05}$
			C	KU	LAB1	LAB2	P1	P2	
Barley	Silo	pH	5.0	4.5	3.9	4.0	4.3	4.3	*0.1*
		Butyric acid (%)	2.00	0.03	0.03	0.03	0.03	0.03	*0.07*
		Stability (d)	6.5	6.5	1.9	1.1	4.5	2.8	*0.8*
	Bale	PH	5.1	5.3	4.0	4.3	5.1	5.4	*0.3*
		Butyric acid (%)	0.05	0.03	0.03	0.03	0.06	0.03	*0.02*
		Stability (d)	1.3	4.8	1.2	4.8	1.7	2.2	*2.5*
Wheat	Silo	PH	4.7	4.4	3.9	3.9	4.1	4.3	*0.1*
		Butyric acid (%)	1.13	0.03	0.03	0.03	0.03	0.03	*0.1*
		Stability (d)	6.5	6.5	6.1	6.5	6.5	6.5	*0.5*
	Bale	PH	5.1	5.2	4.0	4.0	4.9	5.0	*0.2*
		Butyric acid (%)	0.03	0.03	0.03	0.03	0.03	0.03	*0.02*
		Stability (d)	2.6	4.7	2.3	5.8	6.1	5.6	*2.6*

Conclusions Silage additives were more effective in improving the silage quality in wheat forage. Bacterial inoculants were most effective in improving silage fermentation, mainly in baled silages, but only LAB2 containing Na-benzoate improved the stability of bales. The application of 4 l/t P1 and P2 was unsatisfactory in improving the quality of barley bales. KU appeared to be most applicable in both forages regardless of type of silage.

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