Aerobic stability and nutritive value of low dry matter maize silage treated with a formic acid-based preservative

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Introduction Aerobic stability is one of the major problems of the ensiling process, especially in warm climates. Ashbell *et al*. (2002) have shown that at 30°C, the development of aerobic yeast and moulds in silages is most intensive. In Turkey all silages are susceptible to air penetration during storage and unloading with a large proportion of the silage spoiled and in extreme cases all the silage is spoiled. The purpose of the present work was to study the effects of formic acid-based preservative (FAB; Kemisile® 2000, Kemira Oyj-Industrial Chemicals, Finland) on the aerobic stability and nutritive value of maize silage.

Material and methods Maize was harvested at the milk stage (218 g/kg DM). FAB was applied at 1.0, 1.5, 2.0, 2.5, 3.0, 3.5 and 4.0 g/kg to 1.5-2.0 cm chopped fresh maize. Fresh material was ensiled in 1.5 l glass jars (Weck®, Wher-Oflingen, Germany) equipped with a lid that allowed gas to be released. The jars were stored at 26±2°C in laboratory conditions. At the end of a 90 d ensiling period, silages were subjected to a 5 d "bottle" system aerobic stability test (Ashbell *et al.*, 1991). Rumen dry and organic matter degradability of the silage was determined by the *in situ* nylon bag technique developed by Mehrez and Ørskov (1977).

Results FAB decreased lactic, acetic and butyric acid concentrations of maize silage. However, FAB prevented proteolysis in maize silage. Data obtained from the aerobic stability and ruminal degradability of maize silage are given in Tables 1 and 2 respectively. FAB inhibited yeast and mould growth and reduced CO_2 production of silage (Table 1) and improved the aerobic stability of maize silage. At the higher levels of application FAB increased both the dry and organic matter of maize silage (Table 2).

Table 1 The results of the aerobic stability test (5days) of maize silage

Treatment	pH	CO_2 (g/kg DM)	log CFU/g Yeasts	log CFU/g Moulds
Control	4.4±0.1^{a}	6.9±0.5^{a}	4.0±0.3^{a}	4.7±0.3^{a}
1.0	4.1±0.1^{bc}	7.0±0.2^{a}	3.9±0.2^{a}	3.9±0.3^{ab}
1.5	4.0±0.1^{bcd}	7.1±0.4^{a}	3.9±0.2^{a}	3.2±0.3^{bc}
2.0	3.9±0.1^{cd}	7.0±0.2^{a}	3.8±0.3^{a}	2.5±0.2^{cd}
2.5	3.8±0.1^{de}	5.6±0.0^{b}	2.0±0.2^{b}	1.8±0.3^{def}
3.0	3.6±0.1^{ef}	4.7±0.4^{b}	1.6±0.2^{b}	1.5±0.3^{ef}
3.5	3.5±0^{f}	4.7±0.3^{b}	1.8±0.2^{b}	1.1±0.2^{fg}
4.0	3.4±0^{f}	4.6±0.4^{b}	1.6±0.1^{b}	0.5±0.2^{g}

Within a column means followed by different letter differ significantly (P<0.05)

Table 2 Rumen degradability characteristics of maize silage

Treatment	g/kg DM	g/kg OM
Control	462±19^{c}	482±02^{b}
1.0	464±23^{c}	484±15^{b}
1.5	468±06^{c}	496±09^{b}
2.0	469±18^{c}	500±03^{b}
2.5	476±09^{bc}	504±12^{b}
3.0	479±04^{bc}	503±05^{b}
3.5	510±03^{ab}	530±03^{a}
4.0	537±33^{a}	540±20^{a}

Within a column means followed by different letter differ significantly (P<0.05)

Conclusions Aerobic stability is an important factor and care should be taken to minimise losses associated with it. The data presented indicate that FAB can improve aerobic stability and nutritive value of low dry matter maize silage.

References

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