The effects of adding molasses to sugar beet pulp on the silage quality

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Introduction Sugar beet pulp and molasses are by-products from sugar production. In the sugar factory, molasses are added to the sugar beet pulp, which can be used ensiled or dried as an animal feed. In this experiment, two different amounts of molasses were added to sugar beet pulp and the effect on the silage quality, as well as on the aerobic stability, was investigated.

Materials and methods In 2013, round bales only with sugar beet pulp (T-0), sugar beet pulp with 7% molasses (T-7) and sugar beet pulp with 14% molasses (T-14) were produced. The bales had a volume of 1.4 m^3 and a weight of 1088, 1163 and 1196 kg for the three treatments T-0, T-7 and T-14. After a storage period of 120 days samples were taken. Dry matter (DM) and nutrient contents were analysed in the fresh and ensiled material. Furthermore, pH, silage acids, aerobic stability, as well as the microbiological quality (aerobic bacteria, molds and yeasts), were investigated in three bales per treatment. Data were analysed using analysis of variance and Bonferroni-Test (Systat 13).

Results and discussion The addition of molasses significantly increased the DM, ash and water-soluble carbohydrates content (WSC) in the fresh pulp. On the other hand the ADF and NDF contents decreased with increasing proportion of molasses (Table 1). The WSC was degraded during the fermentation process . The more WSC was in the fresh material, the more WSC was degraded and lactic acid was produced (Table 2). But the pH-values were not influenced by the addition of molasses. All silages showed a very good silage quality and reached all the maximum DLG points of 100. With increasing proportion of molasses the silages had a better aerobic stability, but the values were statistically not different. All silages showed a good microbiological quality (Figure 1). The two silages with molasses showed less molds.

Table 1 DM and nutrient contents of the fresh material

		T-0 0% molasses	T-7 7% molasses	T-14 14% molasses	SE	P-value
DM	%	32.4[a]	34.8[b]	37.4[c]	0.17	< 0.001
Ash	g/kg DM	83[a]	93[b]	96[b]	1.0	0.006
Protein	g/kg DM	81[a]	89[b]	95[c]	0.9	0.004
ADF	g/kg DM	239[a]	204[b]	180[c]	2.1	< 0.001
NDF	g/kg DM	484[a]	382[b]	329[c]	5.1	< 0.001
WSC	g/kg DM	18[a]	107[b]	171[c]	7.7	0.002

DM: dry matter; ADF: acid detergent fiber; NDF: neutral detergent fiber; WSC: water soluble carbohydrates; SE: standard error

Table 2 DM, nutrient contents and silage parameters of the different silages

		T-0 0% molasses	T-7 7% molasses	T-14 14% molasses	SE	P-value
DM	%	32.7[a]	35.3[b]	37.9[c]	0.12	< 0.001
Ash	g/kg DM	78[a]	91[ab]	98[b]	4.1	0.041
Protein	g/kg DM	82[a]	91[b]	99[c]	1.0	< 0.001
ADF	g/kg DM	247[a]	222[b]	197[c]	3.7	< 0.001
NDF	g/kg DM	482[a]	412[b]	370[b]	10.1	< 0.001
WSC	g/kg DM	13[a]	28[b]	49[c]	3.1	< 0.001
pH		4.3	4.4	4.4	0.02	0.217
Lactic acid	g/kg DM	22[a]	37[b]	51[c]	0.4	< 0.001
Acetic acid	g/kg DM	5[a]	14[b]	18[c]	0.2	< 0.001
Butyric acid	g/kg DM	0.1[a]	0.4[b]	0.8[c]	0.01	< 0.001
Ethanol	g/kg DM	8[a]	21[b]	26[c]	0.9	< 0.001
NH_3-N/N tot	%	1.6	1.6	1.8	0.33	0.965
DLG Points		100	100	100		
Aerobic stability	hours	66	78	110	16.1	0.218

DM: dry matter; ADF: acid detergent fiber; NDF: neutral detergent fiber; WSC: water soluble carbohydrates; SE: standard error of the means.

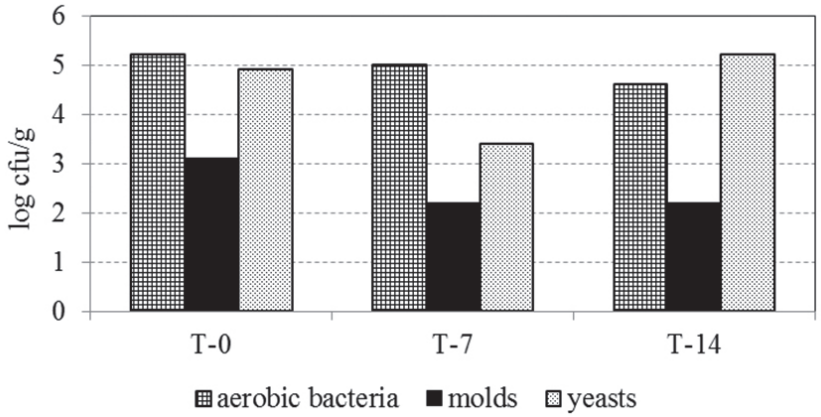

Figure 1 Microbiological quality of the different sugar beet pulp silages with 0, 7 and 14% molasses (cfu: colony format units).

Conclusions The addition of molasses to sugar beet pulp increased the content of DM and water-soluble carbohydrates. However, the latter were rapidly fermented to lactic acid. All silages showed a good silage quality, and the aerobic stability was positively influenced by the addition of molasses.