THE INFLUENCE OF TEMPERATURE RISE ON SILAGE [1])

J. C. DE MAN
Experiment Station for Potato Processing, Groningen, Netherlands

It is generally known that a temperature of about 37° C. is optimal for the development of butyric acid bacteria. Therefore, according to many authors (e.g. RUSCHMANN (1939), VAN ALBADA (1946)), this temperature should be avoided in silage.

BROWN (1950), however, actually advises farmers to allow ample time for temperature rise to 37.8° C. (100° F.) in the preparation of silage. BARNETT (1951) also refers to the generally held view that adequate lactic acid production is ensured only if a temperature of 37° C. is reached. He found, however, that a temperature of 20° C. was also satisfying.

As we could not find direct evidence sustaining either view, we made grass silage in preserving jars and compared silage which had been kept at 35° C. for one week and then at 20° C. for about six months with silage that had been kept at 20° C. throughout. The experiments were performed with grass that had been cut to about one inch and with grass that had been crushed.

Table 1 clearly shows that a temperature of 35° C. was always harmful. It stimulated the formation of butyric acid, while the attainment of a high lactic acid concentration was prevented. In one case putrefaction also set in.

In another experiment the period during which jars were held at 35° C. was varied. The jars were incubated for three months. Table 2 shows that already after one day at 35° C. deterioration of the silage was apparent. This time, however, the formation of butyric acid was entirely prevented by crushing, only the acetic acid concentration being increased.

The data in both tables 1 and 2 constitute a firm warning against temperature rise in silage. The beneficial effect of crushing (DE MAN, 1952) was confirmed.

Table 1.

a) Grass	Temperature	Cut grass					Crushed grass				
		pH	b) NH_3	percentage of acid			pH	b) NH_3	percentage of acid		
				butyric	acetic	lactic			butyric	acetic	lactic
A	20° C.	4.8	18.5	0.70	0.84	1.23	4.1	9.3	0.06	0.94	2.68
	35 & 20° C.	5.0	19.5	1.50	0.92	0.30	4.6	10.1	0.34	1.34	1.03
B	20° C.	no data					5.2	18.6	0.02	0.73	0.47
	35 & 20° C.	available					6.6	41.8	1.06	0.26	0.09

a) Grass A contained 15.6 % dry matter and 21.8 % crude protein in the dry matter; grass B 8.4 and 24.0 % respectively.
b) Ammonia nitrogen as percentage of total nitrogen.

1) Received for publication April 28, 1953.

Table 2.

Days at 35° C.	Cut grass					Crushed grass				
	pH	NH_3	percentage of acid			pH	NH_3	percentage of acid		
			butyric	acetic	lactic			butyric	acetic	lactic
0	4.2	10.3	0.00	0.54	2.47	3.9	8.3	0.01	0.41	2.89
1	4.2	11.6	0.06	0.61	2.26	3.9	8.2	0.00	0.51	2.79
2	4.2	11.9	0.12	0.64	2.21	4.2	8.2	0.00	0.94	2.34
4	4.4	13.2	0.59	0.36	1.86	4.2	8.3	0.00	0.95	2.30
8	4.4	11.7	0.39	0.33	2.05	4.0	8.3	−0.01	0.60	2.72

The grass used contained 16.7 per cent dry matter and 20.6 per cent crude protein in the dry matter.

References

Albada, M. van : Versl. Landbouwk. Onderzoek., *52* (1946) 126.
Barnett, A. J. G. : Biochem. J., *50*, i (1951).
Brown, W. O. : J. Brit. Grassland Soc., *5* (1950) 235.
Man, J. C. de : Nature, *169* (1952) 246.
Ruschmann, G. : Landw. Jahrb., *88* (1939) 182.