

OBSERVATIONS ON THE EFFECTS OF SODIUM HYDROXIDE, AQUEOUS AMMONIA AND UREA ON ENSILING SUGAR CANE TOPS AND PRESSED CANE STALK¹

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Pressed cane stalk and sugar cane top silages were treated with Sodium hydroxide and aqueous ammonia at 1, 2 and 4% and with urea (without and with rumen fluid as a source of ureases). Batches were ensiled for 1, 2 and 4 weeks. The 48 hour degradabilities were assessed by the dacron bag technique and DM loss compared to dried samples of the fresh forage. The only silages degraded significantly relative to the controls were of sugar cane tops. these were urea at 4% and 8% ($P < .02$) ensiled for 2 weeks; all urea treatments (as a group) at 4 weeks ($P < .001$) and 2 weeks ($P < .01$). At 4 weeks all NaOH ($P < .02$) and all NH_4OH 's ($P < .01$) were degraded relative to controls.

Key words: Pressed cane stalk, sugar cane tops, urea, ammonia, Sodium hydroxide, silages, dacron bags

Large quantities of waste material such as sugar cane tops and pressed cane stalk are produced when cane is pressed for sugar production and juice extraction, Both have poor feed characteristics with low intakes and digestibilities when fed to cattle, This experiment was designed to screen a large number of treatments which could be used to treat these materials to improve their feed value,

Materials and Methods

Samples of the sugar cane tops and pressed cane stalk were milled through a Hesston forage harvester to reduce the particle length to 1 - 3 cm. Samples of 2.5 kg fresh sugar cane tops or 2 kg of pressed cane stalk (fresh basis), were ensiled in polythene bags which were thoroughly gassed with carbon dioxide before sealing.

The three additives (sodium hydroxide, ammonia hydroxide and urea) were prepared in solutions as in Table 1, and sprinkled on top of the samples. The urea treatments were replicated using 50 ml of rumen liquor taken from animals on a molasses/urea and sugar cane diet, as a source of urease. The 30% dry matter (DM) samples of pressed cane stalk were obtained by adding a larger quantity of water to the samples in the bag,

Samples of the material ensiled were dried at 100°C for 24 hours to be used later as control samples. Different batches of material were ensiled for 1, 2 or 4 weeks, but all cane was obtained from the same field.

¹ Work partially financed by UNDP/FAO Project DOM/77/002

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Table 1:
Details of the experimental treatments

Additives	Sugar cane tops (2.5kg) (25% DM)	Pressed cane stalk (2kg)	
		30% DM	50% DM
NaOH, % ¹		Water added, ml	
1	50	500	100
2	50	500	100
4	50	500	100
NH ₄ OH, % ¹			
1	50	500	100
2	50	500	100
4	50	500	100
Urea, % ¹			
2	50	500	50
4	50	500	50
8	50	500	50
Urea (rumen fluid), % ¹			
2	50 ²	450 + 50 ²	50 ²
4	50 ²	450 + 50 ²	50 ²
8	50 ²	450 + 50 ²	50 ²

¹ As % of DM

² Rumen fluid

On opening the bags the presence or absence of ammonia was noted and samples taken for DM determinations. Duplicate samples from each silage were used to determine the DM degradability in the rumen using the dacron bag technique as described by Ørskov et al (1980). All samples of the same basal material, including controls were incubated simultaneously in the same animal (up to 28 bags).

The three animals used for incubation received a daily ration of 5 kg (fresh basis) chopped sugar cane, ad libitum molasses with 2.5% urea and 1 kg wheat bran.

Results and Discussion

Rumen fluid was added to provide ureases but the observations at opening suggest that this was unnecessary as all the urea treated bags smelt strongly of ammonia, even after one week of ensiling. The sugar cane top silages became a dark brown colour with urea treatment.

No improvement in dry matter disappearance of pressed cane stalk was obtained with any treatment although Hovell (1979) did obtain enhanced degradability of bagasse by treatment with sodium hydroxide, much other work (FAO 1978) has improved the feeding value of cereal straws by similar treatments. Losada et al (1979) obtained enhanced intakes of whole cane when treated with NaOH even though treatment was for only 24 hours, which would suggest improved digestibility.

The 48 hour degradability of the pressed cane stalk was in the order of 10% as compared with 80% obtained by Hovell using bagasse treated with 8% NaOH compared with 45% DM loss for his control. However, details of treatment were not given.

The distribution of sodium hydroxide may have been rather poor in the pressed cane samples of 50% DM, due to the low volumes used, but in the 30% samples the NaOH was added in a 500 ml solution which thoroughly wetted the sample. However this would not explain the lack of response to ammonia and urea treatment of pressed cane stalk; it is possible that the mechanical damage of pressing cane is not improved by chemical treatment. A further possibility is that cellulolysis is impaired on the chopped sugar cane and molasses/urea diet which was fed to the animals used to incubate the dacron bags. The pH was observed to drop below 5.5 in these animals when fed this ration although pH was not measured at the time of incubation.

Minor and Hovell (1979) have noted that the 1/2 time DM loss of a high fibre protein source, cottonseed meal was 50.2 on a molasses based diet compared with 23.2 on a sugar cane based diet, and Hovell and Fernandez (1979) found a t 1/2 for cellulose of 18 hours on a cane ration and 47 on a molasses/urea diet.

The auger cane tops results suggest that treatment with urea may improve the rumen degradability of silages when compared with fresh, dried material. The only individual DM disappearances that were significantly different ("t" test) from the controls after 2 weeks were urea at 4% and 8% degraded 39 and 42% respectively compared with 18% for the control (both $P < .02$). Ureas tested as a group achieved significance after 2 weeks with degradations of 34% against 18% for control ($P < .001$). At 1 week the degree of degradation was 40.5% against 31% for the control ($P < .01$). With the 2-week silages all NaOH's (as a group) were degraded significantly at 31% ($P < .02$), and all 2-week NH_4OH 's (as a group) at 33% ($P < .01$) both, compared to 18% for the control.

The results suggest that larger scale treatment of sugar cane top silage with urea are warranted and that the ability of the basal diet to degrade effectively the fibre should be examined. A molasses/urea and sugar cane diet may not provide the optimum environment for cellulose digestion and this will be examined.

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Received 20 November 1980