# OBSERVATIONS ON THE DEGRADABILITIES OF FEEDSTUFFS IN SITU IN CATTLE ON DIETS WITH OR WITHOUT MOLASSES

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The degradation of pressed sugar cane stalk, sugar cane tops and cottonwool (as a cellulose source) were measured by the dacron bag technique in the rumen of animals eating chopped sugar cane rations with. or without a molasses supplement.

After 48 hours the respective degradabilities on the molasses diet were significantly less than the diet without molasses and for pressed cane stalk were 7.4% vs 24.0% (P .001), for sugar cane tops were 18.2% vs 31.8% (P <.001) and 26.1% vs 36.9% (P< .01) for the two different samples. The rate of cellulose disappearance was 0.66 and 1.49% per hour with 1/2 times of 90 h and 41 h with and without molasses respectively.

The implication of these results in practical feeding systems is discussed.

Key words: Celluose degradability, rumen pH molasses feeding, dacron bags, chopped sugar cane, Sugar cane tops, pressed cane stalk

The low dry matter losses from silage samples incubated in dacron bags in the rumen of animals on molasses based diets, (Hughes-Jones & Peralta 1981) suggested that this diet was possibly not the most suitable on which to assess the degradabilities of forages in the rumen. The losses were very low, even of silages which had been treated with sodium hydroxide and disagreed with earlier results from this laboratory by Hovell et al cited in Ørskov et al (1980) in which dry matter losses from sugar cane bagasse were in the order of 80% after 48 hours of incubation in the rumen, compared to losses of about 40%, for untreated controls.

Other unpublished observations from here suggested that coconut meal after 24 hours incubation in the rumen of cattle, was degraded more in the absence of molasses than when it was included in the diet. Respective degradabilities were 37.9% and 66.6% (p =.004).

## Materials and Methods

*Part 1*: 3 rumenally canulated bulls of about 450 kg liveweight were fed 2 rations.

(i) Molasses ad libitum (containing 2.5% urea), 5 kg chopped whole sugar cane and 1 kg wheat bran

(ii 10 kg chopped whole sugar cane (with 1% urea fresh basis) and 1 kg wheat bran

A 3 week adaptation period was allowed in changing from ration (i) to ration (ii).

On each ration a series of dacron bags containing 5 g of defatted cottonwool, as a cellulose source, were incubated in the rumen and removed after 6, 12, 24, 36 and 48 hours and dry matter disappearance determined. Rumen pH's were monitored throughout the period of incubation.

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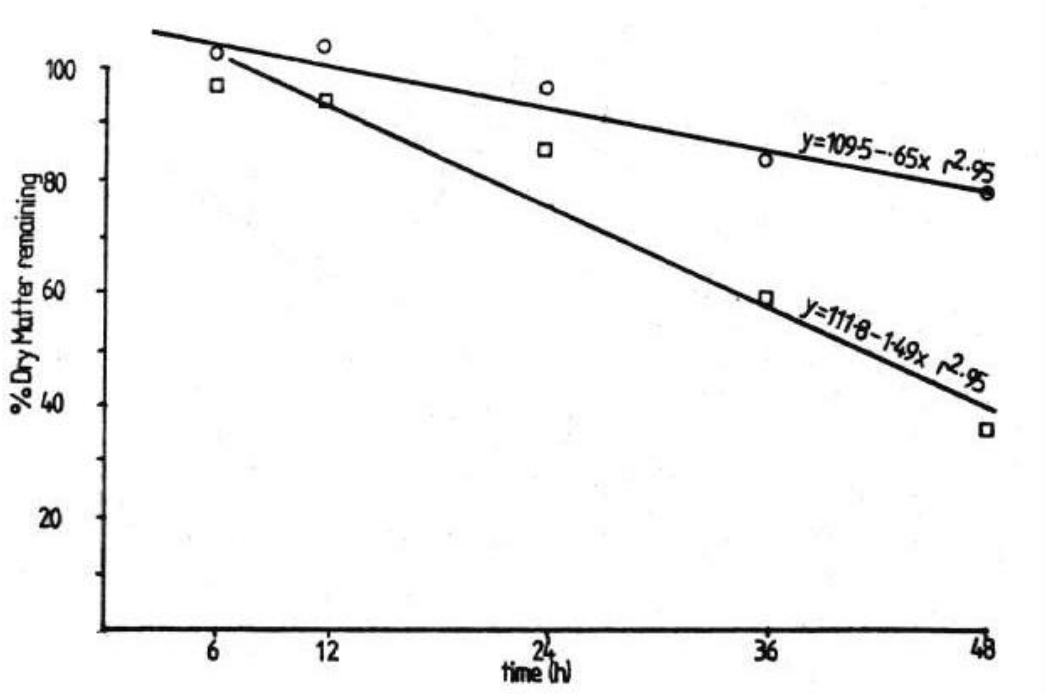
The 1/2 times for dry matter disappearances were determined by fitting a linear function to the curve, which provided a better fit than a logarithmic function over the range of values obtained ( Figure 1).

*Figure 1:*
*Dry matter loss of cellulose from dacron bags on diets with (○) and without (□) molasses*




*Part 2*: Animals and diets were used as in Part 1.

Forage samples of pressed cane stalk and sugar cane tops were dried at 100°C for 24 hours. Samples were passed twice through a laboratory hammer mill (Thomas Wiley No 4, Pennsylvania, USA), without a screen fitted to simulate a masticated sample.

The degradabilities of the dry matters were compared over a 48 hour incubation in dacron bags in the rumen. Six replicates were used on ration (ii) and either 3 or 4 on ration (i). Rumen pH's were not measured at the time of incubation.

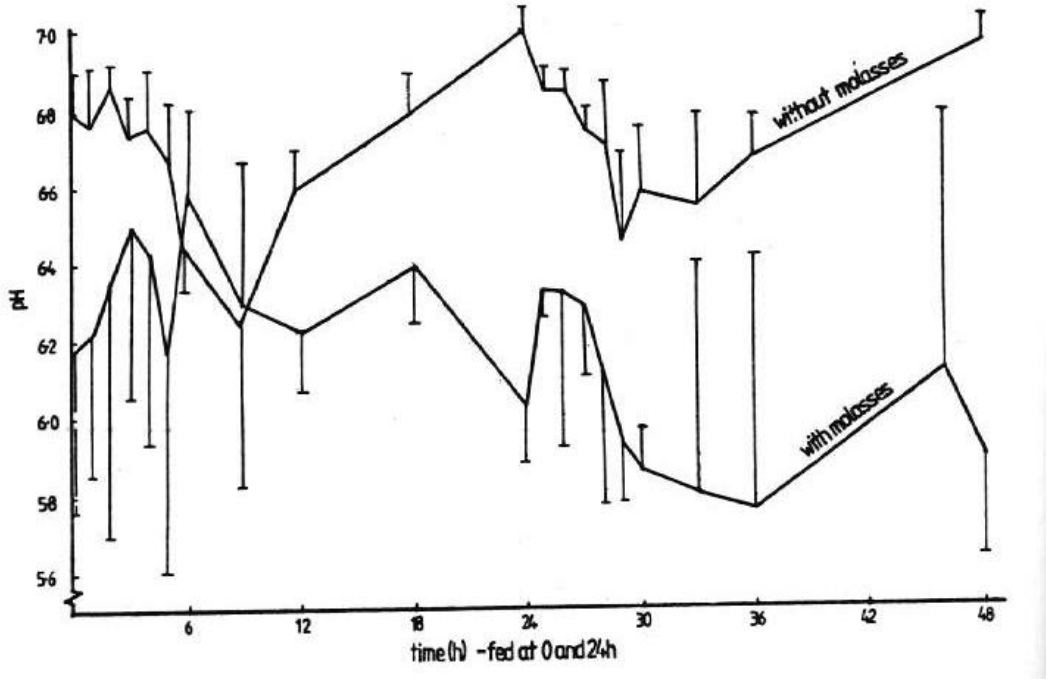
## Results and Discussion

The dry matter disappearances from the cottonwool incubations are shown in Figure 1, with 1/2 times of 41 h and 90 h in diets without and with molasses respectively. There appears to be a distinct lag phase in the first few hours of incubation, in particular on the molasses based diet in which even a slight increase in weight is apparent. This could presumably be caused by microbial biomass and debris retained within the cotton matrix and not removed by washing. However once dry matter loss begins after lag phases of about 14 and 8 hours in diets with and without

molasses respectively, the rate of loss is much higher on the molasses free diet at 1.49% per hour compared with 0.66% per hour.

The pH's throughout the period of incubation are shown in Figure 2 from which a trend of lower pH's is evident on the molasses diet with a diurnal variation producing minimae at about 10 hours post feeding.

*Figure 2.*
*Rumen pH's on sugar cane diets with or without molasses. Means of 3 animals, S.E. 's shown*




The results of part 2 for degradation of dried forage sources is given in Table 1 and all dry matter losses are significantly greater on the molasses free diet at P <.001 for the cane fibre and at P <.001 and P< .01 for the 2 sugar cane top samples.

*Table 1:*
*Forage degradabilities (%) after 48 hours (in dacron bags)*

| | Feed | | |
|---|---|---|---|
| | + molasses | - molasses | Significance |
| Cane fibre | 92.6 ± 3.3 | 76.0 ± 2.2 | P < .001 |
| Sugar cane tops (i) | 81.8 ± 4.0 | 68.2 ± 2.5 | P < .001 |
| Sugar cane tops (ii) | 73.9 ± 1.7 | 63.1 ± 9.2 | P < .01 |

The addition of sugars to dairy cow rations has been shown to depress cellulose digestion (Sutton 1979) and rice hulls disappear significantly (P <.01) faster from dacron bags in sheep on a lucerne diet than on a molasses diet (Kempton et al 1980). Similarly the rate of degradation of cottonseed meal, which contains fairly high levels of fibre, is more rapid on a sugar cane diet than on a molasses diet with 1/2 times of 23.2 and 50.2 hours respectively (Minor & Hovell 1979).

There appears to be a relationship between cellulose degradation and pH, with the lower pH environment unable to support such rapid degradation although Hungate (1966) notes that most cellulolytic strains will grow at pH 5.5 and the pH optimum for Rumenococcus albus is 5.8 - 6.3 which are the ranges encountered in this work. The inhibition of cellulose digestion in vitro seems to be caused by the presence of sugars per se which inhibit cellulose activity in some way, (Hungate 1966), although the nature of the inhibition is unclear.

In a practical situation therefore, the use of sugar based feeds must be carefully considered. If the aim is to maximise use of poor quality forages, for example dry season extensive grazing in much of Africa and South America, the feeding of large amounts of molasses as a carrier for urea is not desirable. The use of high concentrations of urea in molasses, 12.5% vs 2.5%, has not depressed total feed intake, (4.87 vs 4.85 kg/animal) , and has improved feed conversion efficiency from 11.33 to 9.65 respectively, when a sugar cane diet was fed (Silvestre et al 1977). Presumably this would apply to other tropical grasses, in which the advantage may be even more marked as the sugar levels are lower. In extensive situations, it is probably worthwhile to use high urea levels in molasses to ensure adequate Nitrogen intake and keep sugar intake low. Conversely the use of high quality protein forages such as sweet potato and leucaena, which are readily degraded in the rumen, can well complement molasses and gains of over 1 kg/day are achievable (Meyreles and Preston 1981

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