MOLASSES FEEDING TO DUAL-PURPOSE COWS: RESPONSE TO SUPPLEMENTATION OF MOLASSES AND UREA TO A BASAL RATION OF GRASS AND BREWERS' GRAINS

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Three groups of three cows were used in a 3 x 3 Latin Square design so that each group received each one of three diets for periods of one month. A basal diet of at libitum chopped grass (*Brachiaria decumbens*) ant 10 kg/cow/d (2.13 kg DM) of brewers' grains was fed alone or with an ad libitum supplement of pure molasses or a mixture of molasses/urea.

The cows were hand-milked once a day employing the restricted suckling system.

In terms of total milk production the responses to the molasses and the-urea were both in order of 0.7 kg/d (P = 0.06). With respect to liveweight change, while receiving no molasses cows lost 0.68 kg/d, whereas the liveweight losses for cows receiving molasses with or without urea were small (0.15 and 0.08 kg/d respectively).

Calculations show that molasses was inefficiently used for production.

Key words: Dual purpose cows, dry season feeding, supplementation, molasses, molasses/urea

During the dry season a dual-purpose dairy/beef herd was allowed 6 hours restricted grazing in addition to a brewers' grains supplement and molasses with 2.55 urea (w/v) ad libitum. Questions arose as to the efficiency with which the molasses consumed in this system was being used. The present trial was designed to obtain intake and production data on this diet compared with diets with no molasses or pure molasses in place of the molasses/urea mixture.

Materials and Methods

Experimental design: Three groups of three cows were used in a 3 x 3 Latin Square design so that each group received each diet for a period of one month. The first week of each period was allowed for adaptation and the data for the last three weeks used in the analyses.

Animals: Nine crossbred (approximately 1/4 B indicus, 3/4 B taurus) cows were selected from the dual-purpose herd according to calving date, previous milk production and body weight.

The cows had all calved down within a period of 11 days and, when the trial started had been in lactation an average of 13 weeks.

Diets: The basal diet consisted of chopped grass (*Brachiaria decumbens*) ad libitum plus 10 kg/cow/d of fresh brewers' grains (2.13 kg DM). The other two diets consisted of this basal diet supplemented with either pure molasses or molasses with 2.5% urea (w/v) ad libitum.

Management: The cows were hand-milked together as one group between 0800 and 0900 hr under a restricted suckling system. The calf was allowed to suckle its dam

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for a few seconds before milking to stimulate milk let down and then tied at the head of the cow during the milking process. A part of one quarter was left for consumption by the calf during a 30 minute period after milking. A commercially available mastitis test (Californian type) was carried out on each cow 5 days per week to detect subclinical mastitis.

Freshly cut and chopped grass (*Brachiaria decumbens*) was offered daily at around 1000 hr after the previous days refusals had been removed and weighed. At around 1500 hr the troughs were refilled with grass weighed that morning and the fresh brewers' grains were fed. Directly afterwards the covers were removed from the molasses tanks to allow access, these covers were replaced the following day at 0800 hr.

The calves ran with calves of the rest of the herd receiving the same diet of chopped whole sugar cane, molasses with 2.5% urea (w/v) both ad libitum plus a supplement of fresh brewers' grains of approximately 2.5 kg /d. Feed intakes of the calves were not measured.

Measurements taken: Total milk production was measured 5 days per week. Milk consumed by the calf was estimated by weighing before and after suckling, while the milk in the bucket represented saleable milk production.

Daily intake of the chopped grass (Brachiaria decumbens) and weekly intake of molasses was measured 'for each group of cows.

Daily samples of grass and brewers' grains were taken for dry matter analysis . °Brix of the molasses was taken as an estimate of the dry matter content.

Results

The dry matter intake of the cows is shown in Table 1. Total dry matter (DM) food intake on the molasses supplemented diets was high, due to very high

Table 1:

Dry matter intake of cows receiving a basal dry-season diet unsupplemented or supplemented with pure molasses or molasses with 2.5% urea (w/v) ad libitum

		Basal diet +			
	Basal diet	Pure molasses[1]	Molasses + 2.5% urea[2]	$SE_{\bar{x}}$	P
Individual dry matter intakes (kg/d)					
Total	10.39	13.97	15.14	0.349	.02
Grass	8.26	5.69	5.73	0.428	.04
Molasses	-	6.15	7.28	0.240	.03
Brewers' grains	2.13	2.13	2.13	-	

[1] 85°Brix
[2] 76°Brix

molasses intakes. When molasses was offered, individual grass intakes fell by 2.5 kg DM/d while molasses and molasses/urea intakes of 6.2 and 7.3 kg DM/d respectively were recorded. The production data are shown in Table 2. In terms of total milk production the responses to the molasses and to the urea were 0.7 and 0.6 kg/d respectively (P = 0.06). With respect to liveweight change, cows receiving no supplementation lost 0.68 kg/d, whereas liveweight losses for cows receiving molasses with or without urea were small (0.15 and 0.08 kg/d respectively).

The overall regressed liveweight gain of the calves during the experimental period was 0.34 kg/d.

Table 2:

Daily milk production and liveweight change of cows receiving a basal dry-season diet unsupplemented or supplemented with pure molasses or molasses with 2.5% urea (w/v) ad libitum

		Basal diet +			
	Basal diet	Pure molasses	Molasses + 2.5% urea	$SE_{\bar{x}}$	P
Total milk production (kg/d)	6.10	6.80	7.41	0.176	0.06
Saleable milk production (kg/d)	4.51	5.28	5.58	0.140	0.06
Milk consumed by calf (kg/d)	1.59	1.52	1.83	0.115	0.33
Liveweight change of cow (kg/d)	−0.677	−0.082	−0.148	0.32	0.40

Discussion

The molasses intakes recorded were high but of the same order as those recorded by Gill et al (1981). These workers recorded intakes by dairy cows of molasses plus urea (2.5% urea w/v) ranging from 6.3 to 7.5 kg DM/ cow/d.

The efficiencies of utilisation of the molasses and molasses/urea mixture are very low. The differences between the unsupplemented and the pure molasses-supplemented diet in terms of food intake and production are shown in Table 3. From this Table it can be estimated that the molasses supplied approximately

Table 3:

To show the difference (molasses supplemented diet minus the basal diet) in terms of intake and production between the basal diet and the same diet supplemented with pure molasses

Difference (supplemented-basal)	kg/d	Estimated metabolisable energy value[1] MJ ME/kg	Energy value of the difference MJ ME
Dry matter intake			
Dry season grass	− 2.57	5.6[2]	− 14.4
Pure molasses	+ 6.15	− See text	−
Production			
Milk production	+ 0.70	5.1	3.6
Liveweight change	+ 0.595	28	16.7

[1] From MAFF (1977)
[2] Value for wheat straw

34.7 MJ Metabolisable Energy (MR) (3.6 + 16.7 - (-14.4)) its energy content thus being 5.6 MJ ME/kg DM. The value given for molasses under the ME system is 12.7 MJ ME/kg OM (MAFF 1977). There is therefore a considerable drop in the ME value of molasses when high levels are incorporated into the diet. A similar effect has been reported by Lofgreen and Otagaki (1960) who found the net energy value of molasses at 30% of the total ration to be about one third that of molasses when included at 10% of the ration (6.29 vs 2.13 MJ NE /kg). These workers also reported that this loss of energy was not due to increased faecal loss. The energy must therefore be lost in the form of methane, in the urine or as additional heat loss. If the increased energy losses occur by increased urinary excretion of energy they could be explained under the following hypothesis. Volatile fatty acids (VFA) proportions in the rumen of cattle fed high levels of molasses are characterised by low proprionic acid concentrations (Rowe et al 1979). This VFA pattern is very similar to that seen in ketotic dairy cows (Table 4), in that the level of ketotic fatty acids (acetate and butyrate) is exceptionally high in relation to the proprionate which is gluconeogenic. It could be that, in diets where high levels of molasses are being fed, proprionate production is insufficient to provide sufficient oxaloacetate to feed the Krebs (TCA) cycle.

Table 4:

Volatile fatty acids in the rumen of cows under conditions of clinical ketosis (Radloff & Schultz 1967) compared with those in cattle consuming molasses (Rowe et al 1979)

	Acetate	Proprionate	Butyrate + others
Clinical ketosis	60.7	17.8	21.8
Ration of 4.2 kg molasses (70% DM) plus 3% urea and 11 kg sweet potato forage (17% DM)	69	15	16

Ketones will then be formed and energy lost through the urine in the form of aceto-acetic acid and β-hydroxy butyric acid.

In conclusion the feeding of high levels of molasses to milking cows is an energetically wasteful process and only economic in the Dominican Republic because molasses destined for the agricultural sector is highly subsidized. It has been useful in the past in the maintenance of body weight during the dry season, however future research should investigate more efficient methods of doing this.

Investigation of ketone body levels in the urine of animals consuming high levels of molasses is an additional area of future work.

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