Tropical Animal Production 1984 9:30-34

EFFECT OF VARIOUS LEVELS OF MOLASSES SUPPLEMENTATION ON INTAKE OF MATURE *Pennisetum purpureum* FORAGE BY GROWING CATTLE

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In a change-over experimental design seven Holstein cattle (4 bulls initially 203-222 kg liveweight and 3 heifers initially 140-180 kg liveweight) were given *Pennisetum purpureum* forage (60-65 d regrowth) ad libitum, 0.25% liveweight of a mixture containing sesame seed meal minerals and salt, and each of 4 levels of a molasses-urea supplement (0.0, 0.2, 0.4 and 0.8% of liveweight on a dry matter DM basis). Intake of the supplements was always complete. Intake of forage was measured daily and the animals were weighed weekly to determine liveweight gain. Forage DM intake in the absence of molasses was high (2.96% liveweight) and there was a linear depression ($P < 0.01$) in forage intake with increasing levels of molasses supplement (substitution rate 0.62 kg forage DM/kg molasses DM). Liveweight gain and feed conversion were not different ($P > 0.05$) between the various levels of molasses supplementation, and were 723 ± SE 121 g/d and 11.4 ± SE kg DM intake/kg liveweight gain respectively. The results demonstrated that total DM intake was not increased substantially by supplementation of mature tropical forage with molasses-urea due to the substitution of forage by supplement.

Key words: Growing cattle, molasses, *Pennisetum purpureum*.

Although tropical grasses have the advantage of high dry matter (DM) production per unit area, a frequently observed problem in using such forage as a basis for ruminant diets is an inadequate intake of digestible energy. This is particularly a problem when the forage is mature and when the animals being fed have a high energy requirement such as is the case for lactating cows. Supplementation of the forage with feeds high in sugar or starch and therefore of high digestibility is a method frequently used to increase the availability of energy from the diet, but such concentrates frequently reduce the digestibility and intake of the forage (Fick et al 1973; Ørskov and Fraser 1975; Ørskov et al 1978).

The present experiment examined the extent of substitution of various levels of molasses-urea supplement for mature *Pennisetum purpureum* forage in growing cattle.

Materials and Methods

Four Holstein bulls (initially 203 - 222 kg liveweight) and three Holstein heifers (initially 140-180 kg liveweight) were housed in partially-paved and partially-roofed individual pens. The cattle were given *Pennisetum purpureum* forage (60-65 d regrowth) at 0900-1000 h each day with an allowance of 20-30% refusals. Supplements consisting of 0.25% liveweight (DM basis) of a protein meal-mineral-salt mixture, and one of four levels (0.0, 0.2, 0.4 and 0.8 % liveweight on a DM basis) of molasses-urea were

also given in a separate feeder at 900-1000 g each day. These supplements were usually consumed immediately. The protein meal-mineral-salt mixture consisted on an air-dry basis of 72.2% sesame seed meal, 18.2% commercial mineral mixture containing mainly dicalcium phosphate and 9.1% salt. The molasses-urea supplement was prepared by mixing 3 kg urea plus 6 kg water with 100 kg molasses.

The cattle were allocated to each of the 4 diets at random during 4 periods such that each animal received each dietary treatment. The experiment was carried out during the dry season from November 1982 to April 1983. It was originally intended to allow 2 weeks for adaptation and to measure forage intake during weeks 3 and 4 of each period, but due to difficulties of forage supply periods 1 and 2 had to be continued for 5 and 7 weeks respectively. During the last 2 weeks of each experimental period forage offered and forage refused were sampled daily and bulked on a weekly basis for determination of DM content. Supplements were sampled each period. Proximal analysis of the dietary components was carried out by standard procedures (AOAC, 1975).

Solubility in 0.15 M NaCl and rate of ruminal digestion of the sesame seed meal was determined using nylon bags (Ørskov *et al.* 1980) incubated in the rumen of 2 fistulated steers consuming *Pennisetum purpureum* forage alone. Density of the sesame seed meal was determined in triplicate using the following procedure. A 100 ml volumetric flask was weighed empty, after addition of approximately 25 g air-dry sesame seed meal, and after further addition of water (taking care to eliminate bubbles of air) to the 100 ml volume. From the volume of water displaced by a known weight of sesame seed meal the specific gravity was calculated directly.

Statistical analysis was carried out by analysis of variance and linear regression.

Results and Discussion

The proximal analysis of the forage offered, forage refused and the supplements are given in Table 1. Observations during the experiment suggested that feed refusals contained a higher proportion of stem than the feed offered, and these differences were reflected in significantly ($P < 0.05$) lower N and higher NDF and ADF contents of the forage refused than of the forage offered

Intake of forage DM (Figure 1) was 2.96% liveweight in the absence of the molasses-urea supplement, and was decreased ($P < 0.01$) by addition to the diet of this supplement with a substitution rate of 0.62 kg of forage DM for each kg DM of molasses-urea supplement. This substitution rate was similar to that of 0.87 observed by Alvarez et al (1983) for growing heifers given similar forage and supplements based on maize flour residue and cotton seed meal. Total DM intake was increased ($P < 0.05$) from 3.18% liveweight with the highest level (0.8% DM basis) of molasses-urea supplementation. When it is considered on the basis of other experiments (Romero et al 1983) that organic matter digestibility of the diet was probably increased by less than 5%, the intake of digestible energy with the 0.8% level of molasses-urea supplementation was probably increased by less than 20%.

Table 1:
Proximal analysis of dietary components.

	Dry matter (%)	Organic matter (%)	N x 6.25 (%)	NDF (%)	ADF (%)	Lignin (%)	Silica (%)
Forage offered							
Period 1	24.1	87.9	7.62	73.2	46.9	8.9	5.4
2	20.5	87.7	7.54	74.0	48.2	9.7	5.9
3	23.5	86.6	7.81	74.5	50.8	12.5	5.9
4	16.3	86.5	7.85	73.3	52.9	13.6	4.6
$\bar{x}$	21.1	87.2	7.70	73.8	49.7	11.2	5.5
Forage refused							
Period 1	27.3	88.6	6.19	75.1	50.8	11.7	5.2
2	27.1	88.6	7.06	74.5	49.6	10.7	6.3
3	26.3	87.9	7.09	75.7	52.4	12.8	5.2
4	23.6	88.2	6.69	75.3	54.6	12.7	3.6
$\bar{x}$	26.1	88.3	6.76	75.2	51.9	12.0	5.1
Sesame seed meal	94.8	65.8	32.3	-	-	-	-
-minerals-salt							
Molasses-urea	70.2	88.0	16.0	-	-	-	-

Ether extract of sesame seed meal = 4.5%

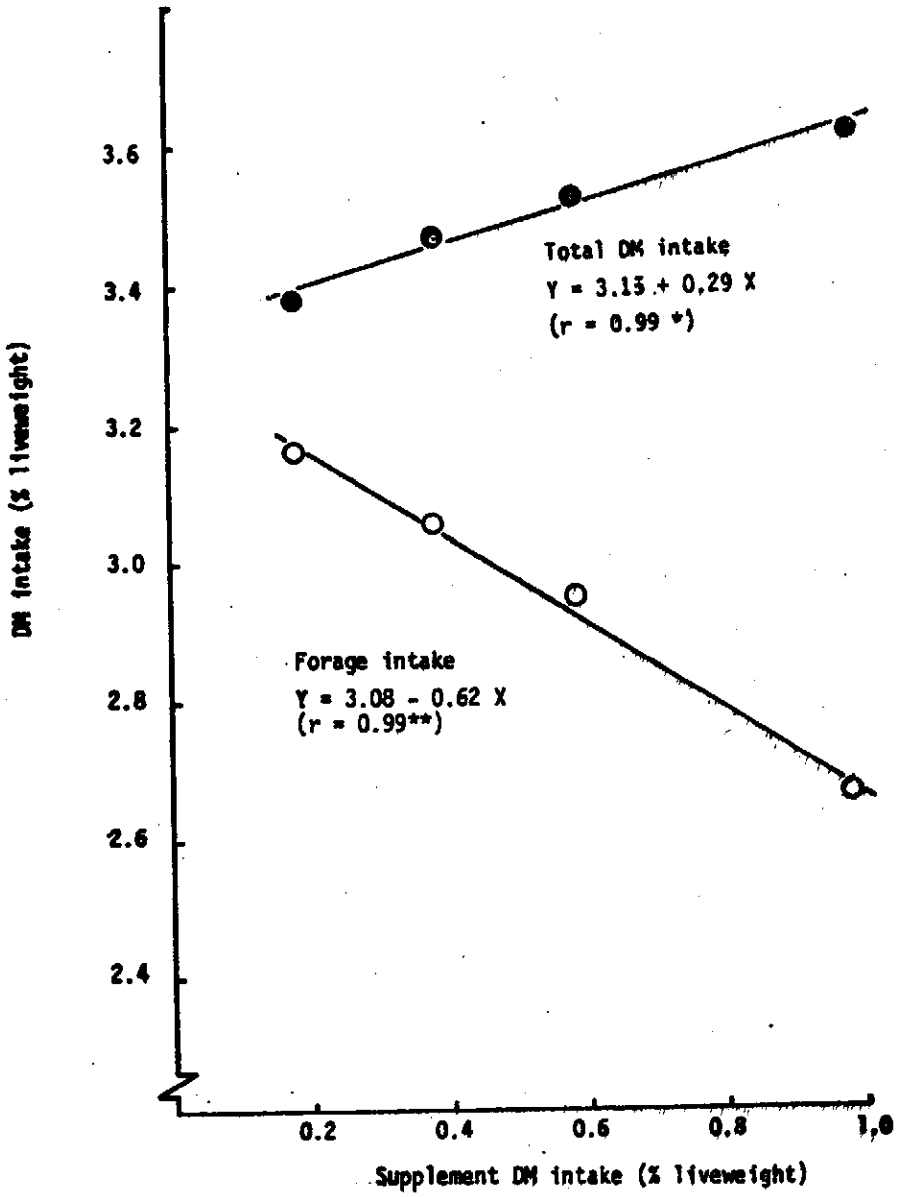
NDF, neutral detergent fibre; ADF, acid detergent fibre.

Liveweight gain and feed conversion were not different ($P < 0.05$) between the dietary treatments, and were on average 723 ± SE 121 g/d and 11.4 ± SE 1.4 kg feed DM/kg liveweight gain respectively.

The sesame seed meal used in this experiment was digested rapidly in the rumen (zero time N solubility = 30%; T 1/2 of N digestion = 9 h). However the meal had a high specific gravity (1.3 - 1.4) which may have enhanced its rapid passage from the rumen (Campling and Freer 1962) and hence the proportion of the sesame seed meal protein bypassing the rumen.

There was a high intake of *Pennisetum purpureum* forage in the absence of the molasses-urea supplement (2.96% liveweight), and since this intake was maintained for 20 weeks it was apparently not associated with short-term effects such as compensatory growth. Furthermore the growth rates and feed conversions were consistent with this level of intake of forage of moderate digestibility; organic matter digestibility in sheep of the forage used during Periods 1 and 2 was 55% (Romero et al 1983). High intakes of similar *Pennisetum purpureum* forage given alone have been observed previously in steers during the dry season (2.7% liveweight), but this intake was considerably higher than in the same steers during the wet season (1.9% liveweight) or in lactating cows (0.7 - 1.2 % liveweight) (Arias and Combellas 1980).

Figure 1:
Mean DM intake by 7 growing cattle of forage (o) of forage supplement of sesame seed meal and molasses-urea (●)



The reasons for these differences are not clear; however it is obviously of importance to examine the reasons for such differences and to examine the possible role of the sesame seed meal supplement.

In conclusion the experiment demonstrates the inefficiency of supplementation with readily fermentable carbohydrate to increase digestible energy intake when mature tropical forage is used as a basal diet.

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Received February 1, 1984