MOLASSES SUPPLEMENTATION OF FRIESIAN COWS GRAZING IRRIGATED COUCH/PANGOLA PASTURES

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SUMMARY

The effect of molasses supplementation on milk production and composition of Friesian cows grazing irrigated couch grass pasture at 5.9 cows/ha was studied. Molasses levels used were nil, 1.2, 2.4 and 3.6 kg/cow/day. Production responses were determined over three successive 12-week periods commencing just after calving.

Over the full trial period milk, fat and solids-not-fat (SNF) yields increased linearly ($P<0.05$) with level of molasses feeding. The milk production response per day of lactation was 0.6 *l* milk/kg of molasses fed. Molasses increased fat ($P<0.05$) and SNF ($P = 0.06$) concentrations. Change in live weight was not affected by level of molasses.

INTRODUCTION

Tropical pastures are capable of producing high dry matter yields which can support high stocking rates and high levels of milk production per unit area (Cowan *et al.* 1975; Chopping et *al.* 1976). However, production per cow is generally low (Dale and Holder 1968), probably because intake of nutrients is restricted by the low digestibility of tropical pastures (Hamilton *et al.* 1970). In north Queensland energy supplementation has produced significant milk yield responses in cows grazing tropical pastures (Chopping et *al.* 1976; Cowan et *al.* 1977; Cowan and Davison 1978). Cowan and Davison (1978) compared supplements of molasses and grain at equal energy levels and at high and low pasture availability and found no difference between the supplements at either level of pasture. They concluded that on an "as is" basis molasses will replace grain in the ratio of 1.3:1 without affecting production, and that on most Queensland dairy farms, molasses feeding is economically favourable. However, there is no information on the relationship between level of molasses feeding and milk production for cows grazing tropical pastures.

MATERIALS AND METHODS

The experiment was conducted at Ayr Research Station in a tropical coastal area of predominantly summer rainfall (1092 mm annual average), 100 km south of Townsville, Queensland.

Twenty-four Friesian cows calving between 14.6.77 and 6.9.77 were randomly allocated to treatments in a 4 x 2 factorial design, based on four levels of molasses and two calving periods. The first 12 animals to calve (14.6.77 to 17.7.77) were allocated to the early calving treatment, and the second 12 (17.7.77 to 6.9.77) to the late calving treatment. All animals entered the experiment on 26.7.77.

Early calving animals calved on average 34 days prior to commencement of the experiment. They were fed a standard ration of lucerne hay ad *lib.* and molasses from calving. Their milk yields over the seven days prior to commencement of the trial were used to rank animals for allocation to treatments, and as a covariate for the statistical analysis of milk production.

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Late calving cows calved on average 20 days after entry to the experiment. At calving, they were removed and fed the standard ration for 16 days. Milk yields for days 10 to 16 were used as covariate data for the analysis of milk production. During this period, stocking rates in treatments were maintained with extra dry cows, Levels of molasses were nil, 1.2, 2.4 and 3.6 kg/cow/day. Molasses contained 2% urea and 1% mono-ammonium phosphate and was fed to the animals individually in the paddock five days per week at 1.4 times the daily allowance. Animals at the two lower levels consumed their daily ration within 15 minutes. At the high level of feeding, molasses not consumed within 15 minutes was left in the paddock for group feeding.

The pasture grazed was irrigated couch (*Cynodon dactylon*) and pangola (*Digitaria decumbens*). It was topdressed with 150 kg urea after each grazing (six weekly) and annually with 500 kg superphosphate and 125 kg muriate of potash in August. Paddocks were irrigated with approximately 50 mm water every 14 to 21 days. Animals grazed in a three-paddock rotation of two weeks in, four weeks out, at a stocking rate of 5.9 cows/ha. An electric fence confined animals to half the area during the first week in each paddock. Milk yields were recorded twice daily, with a composite daily sample taken once weekly for compositional analysis and animals were weighed monthly.

RESULTS

Results were analyzed over three 12-week periods; 1) winter/spring 26.7.77 to 17.10.77, 2) spring/summer 18.10.77 to 9.1.78 and 3) summer/autumn 10.1.78 to 3.4.78. The effect of molasses level on adjusted milk production, actual butter-fat (BF) and solids-not-fat (SNF) yields and concentrations, and lactation length are shown in Table 1. Values in Table 1 are averages for actual days of lactation only. When animals were dry for part of a period, dry days were not included in determining mean production values for the period. The linear regression coefficients for the relationships between production and level of molasses are also shown in Table 1. In all cases early and late calving cows responded similarly to molasses supplementation, so results from calving period treatments have been combined. Cubic and quadratic components of regression against molasses level, were, in all instances, non-significant.

In all periods increasing the molasses level resulted in higher milk yields. The linear regression coefficient for daily milk yield versus molasses level was significant in all periods ($P<0.05$). Over the full trial period (252 days) each kilogram of molasses (wet basis) fed during lactation increased milk production by 0.6 l. Milk responses to molasses increased steadily for the first eight weeks on treatment and thereafter remained relatively constant until late lactation. During the third period (summer/autumn) the response was 0.48 l milk/kg molasses compared to responses of 0.64 and 0.70 l milk/kg molasses in periods 1 and 2. Supplementation with molasses had no effect on lactation length.

Over the full trial period molasses feeding increased BF but not SNF concentrations, the linear regression coefficients being significant for BF ($P<0.05$), but not for SNF ($P = 0.06$). BF and SNF yields increased linearly with level of molasses ($P<0.05$) in a similar fashion to milk production. The linear regression coefficients of BF and SNF concentrations and yields were non-significant in the first period, but were significant ($P<0.05$) in the second.

There were no differences in liveweight (LW) change over the trial due to level of molasses supplementation. Early calving cows receiving nil, 1.2, 2.4 and 3.6 kg molasses/day gained 60, 84, 58 and 59 kg LW over the trial period. Corresponding gains for the period post-calving to the end of the trial for late calving cows were 62, 51, 52 and 61 kg. Irrespective of calving date and supple-

TABLE 1 Effect of level of molasses supplementation on milk yield and composition

Milk Component	Period†	Level of Molasses (kg/cow/day)				Linear regression Coefficient
		0	1.2	2.4	3.6	
Milk yield (l/day)	1)	10.2	11.3	11.4	12.8	0.64**
	2)	7.2	8.6	9.0	9.9	0.70**
	3)	4.2	4.6	5.5	5.8	0.48*
	Trial	7.2	8.1	8.7	9.4	0.60**
BF (g/l)	Trial	36	38	40	41	1.5*
BF yield (kg/day)	Trial	0.26	0.29	0.33	0.39	0.034**
SNF (g/l)	Trial	82	84	84	85	0.8
SNF yield (kg/day)	Trial	0.62	0.66	0.70	0.82	0.055*
Lactation length (days)	Trial	210	226	247	237	8.4
	Total	235	251	268	259	8.1

† Period 1) 26.7.77 to 17.10.77 (84 days); Period 2) 18.10.77 to 9.1.78 (84 days); Period 3) 10.1.78 to 3. 4.78 (84 days); Trial 26. 7.77 to 3.4.78 (252 days).
* $P<0.05$ ** $P<0.01$

ment level, animals lost weight until the end of October, and then gained weight steadily. At the end of the trial, 9½ months and 8 months post-calving for early and late calving cows respectively, animals had regained their 1977 pre-calving weights.

DISCUSSION

At the highest level of supplementation in this trial, molasses was providing an estimated 20% of total ration dry matter. Our results indicate that up to this level of supplementation, milk production responses to molasses are linear. Feeding at levels above 25% of total ration dry matter in other trials (Lofgreen and Otagaki 1960; Chopping unpublished data) has resulted in health problems and lower average responses in milk production and is not recommended.

The average response of 0.6 l milk/kg molasses fed (wet basis) is in general agreement with responses recorded by Chopping et *al.* (1976 & unpublished data), and Cowan and Davison (1978). Results of these trials suggest that where molasses is fed for a long period, responses average 0.6 to 0.9 l milk/kg molasses fed, the exact value being affected by such factors as feeding period, stocking rate, whether molasses was fed during non-lactating periods, or whether effects on lactation length are included. Our results indicated that milk responses to molasses below the range quoted above may be obtained when measured in short term trials (<8 weeks), and when molasses is fed to animals in late lactation. For example, the linear regression coefficient for milk production and molasses level in the third period of this trial was 0.48 l milk/kg molasses fed. This is the same as the late lactation response established by Chopping et *al.* (unpublished data) of 0.47 l milk/kg molasses for cows grazed on couch grass or couch oversown with annual ryegrass and clover at 7.0 cows/ha.

In the experiments of Chopping et *al.* (1976 and unpublished) molasses feeding had no effect on LW gain. Cowan and Davison (1978) concluded that the significant increase in LW gain for animals receiving molasses supplementation in their trial may have been due to other factors apart from the supplement. It would seem that where molasses is fed to lactating animals grazing tropical pastures, most of the resultant increase in net energy intake is used for increasing milk production. However, molasses can be used as an energy supplement for growing stock. R.J. Moss (personal communication) has found that when fed to weaners over six months of age, molasses and grain at equal dry matter intakes give identical growth rates,

Milk production responses to molasses in trials in north Queensland have been similar to responses obtained from grain on an equal dry matter basis (Cowan et *al.* 1977; Cowan and Davison 1978). Results of this trial would suggest that this comparison of molasses and grain is valid for supplement intakes up to 20% of total ration dry matter. Molasses can be delivered to most Queensland dairy farms for less than half the price of cereal grain, making it a more economical supplement for milk production.

REFERENCES

CHOPPING, G.D., DEANS, H.D., SIBBICK, R., THURBON, P.N. and MRS J. STOKOE (1976). Proc, Aust. Soc. Anim. Prod. 11: 481.

COWAN, R.T., BYFORD, I.J.R. and STOBBS, T.H. (1975). Aust. J. Exp. Agric. Anim. Husb. 15: 740.

COWAN, R.T., DAVISON, T.M. and O'GRADY, P. (1977). Aust. J. Exp. Agric. Anim. Husb. 17: 373.

COWAN, R.T. and DAVISON, T.M. (1978). Aust. J. Exp. Agric. Anim. Husb. 18: 12;

DALE, A.B. and HOLDER, J.M. (1968). Proc. Aust. Soc. Anim. Prod. 7: 86.

HAMILTON, R.I., LAMBOURNE, L.J., ROE, R. and MINSON, D.J. (1970). Proc. XI Int. Grassld Congr. p. 860.

LOFGREEN, G.P. and OTAGAKI, K.K. (1960). J. Dairy Sci. 43: 220.