EFFECT OF THREE LEVELS OF GRAZING NUTRITION UPON CALVING AND SUBSEQUENT PERFORMANCE IN HEREFORD HEIFERS

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Summary

Three groups of 20 Hereford heifers grazed either (a) poor quality Rhodes grass (Chloris gayana), (b) Rhodes grass supplemented with 1.82 kg cottonseed meal every second day, or (c) grain sorghum (Sorghum vulgare) crop for the final 12 weeks of pregnancy. All heifers calved as three-year-olds,

There were no significant differences in calf birth weight and size between treatments in spite of diet-induced differences in mean heifer liveweight of up to 81 (± 7.4) kg 24 hours post-calving. There was a significantly higher incidence of stillbirth in the poorest-fed Rhodes grass heifers and two of these died as a result of dystocia compared with no dystocia or mortality in the other treatments. Pelvic size between treatments was similar and it is inferred that the inferior calving performance was associated with reduced calving endurance in the poorest-fed Rhodes grass heifers. These animals subsequently reared calves which were significantly lighter in liveweight and grew at inferior rates throughout the pre-weaning period.

Conception rates in remated dams were similar in all groups.

I. INTRODUCTION

Management on dystocia-affected properties usually involves regular daily inspection of calving heifers and provision of assistance when necessary. In Queensland this presents obvious difficulties due to the extensive nature of many properties, and might be avoided if dystocia incidence could be reduced by controlling nutrition.

Graziers and some scientists have believed that calf oversize dystocia can be reduced in the primiparous heifer by reducing the plane of nutrition in late pregnancy (Williams 1968). The apparent objective here has been to deprive the developing foetus of excessive nutrients (McCarthy 1965; Wigglesworth 1966) and so ensure a smaller sized foetus which may negotiate the birth canal more easily. There is also evidence that heifers have difficulty when calving in excessively fat condition (Bond and Wiltbank 1970). If dietary restriction during the final trimester reduces calf size and increases calving efficiency without producing undesirable consequences, this would have worthwhile commercial application.

The purpose of this experiment was to determine whether dietary restriction in the final trimester would reduce calf birth weight and size and thereby improve calving performance. In addition, the effect of pre-calving nutrition levels upon subsequent growth rates of calves and rebreeding fertility of dams was assessed.

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II. MATERIALS AND METHODS

The experiment was conducted on Brigalow Research Station (mean annual rainfall - 673 mm) located 32 km north-west of Theodore in Central Queensland. Sixty Hereford heifers which had been paddock-mated to four Hereford bulls were allocated to the three treatments by stratified randomisation based on pregnancy status during the first trimester and liveweight approximately twelve weeks prior to calving. Prior to treatment commencement on 14 May, 1971 all heifers shared common grazing.

(a) Treatments

Treatment A - twenty heifers grazed Rhodes grass (Chloris gayana) for the final 12 weeks of pregnancy - controls.

Treatment B - twenty heifers grazed Rhodes grass group supplemented in troughs with 1.82 kg cottonseed meal (C.S.M.) per head every second day for the final 12 weeks of pregnancy.

Treatment C - twenty heifers grazed hybrid grain sorghum (Sorghum vulgare cv. DeKalb E57) in head for the final 12 weeks of pregnancy,

(b) Observations

Following treatment commencement heifers were weighed at three-weekly intervals prior to calving, at 24 hours post-calving and on 28 January, 1972.

. Vertical and horizontal pelvic dimensions were measured with a rectal calliper twelve days prior to the onset of the calving period. Pelvic area was calculated from the product of vertical and horizontal measurements (Young 1968).

Heifers were inspected three times daily to detect calving difficulty and render assistance where necessary. All heifers calved in their treatment paddocks. Newborn calves were identified with their dams, ear-tagged, weighed and their head width, wither height, chest depth, body length and hip width measured. Dystocia, stillbirth and dam mortality were recorded as previously described (Hodge 1975).

After calving, heifers and calves grazed a common paddock of oats (Avena sativa cv. Camelia) for two months, and thereafter,, a superior quality pasture comprising Chloris, Cenchrus and Panicum species until weaning on 15 May, 1972. Calves were weighed at three months, six months and eight months of age when weaned.

Two Hereford bulls were introduced from 28 September, 1971 for four months to assess rebreeding fertility of lactating dams. Conception date was calculated from foetal age estimations. Calving to conception intervals for pregnant dams were assessed from known calving dates.

III. RESULTS

The results are shown in Table 1, The difference in weight gain between all groups was substantial and significant. Paddock observation

TABLE 1
Pre-calving, calving and post-calving performance in three treatments

		Pre-calving treatments A Rhodes Grass	B Rhodes C.S.M.	C Sorghum	Av. S.E. of Mean	Significance
Pre-calving heifer data						
Liveweight 12 weeks pre-calving 14.v.71	(kg)	410.9	415.6	419.4	5.9	N.S.
Liveweight immediately pre-calving 16.vii.71	(kg)	399.6	427.5	468.1	5.8	B,C > A**,C > B*
Liveweight change per day 14.v.71 to 16.vii.71	(kg/d)	- 0.18	0.19	0.77	0.04	B > A**,C > A**, C > B**
Pelvic area 9.vii.71	(sq cm)	271.2	273.9	286.0	3.3	N.S.
Calving data						
Number of dystocias:stillbirths: dam mortalities per 20 calvings		3:4:2	0:0:0	0:0:0		N.S.:A > B, C*:N.S.
Calf birth weight	(kg)	25.86	27.39	27.81	0.84	N.S.
Calf chest depth	(cm)	24.00	24.69	25.44	0.43	N.S.
Calf body length	(cm)	52.50	54.22	54.51	1.12	N.S.
Post-calving data						
Dam liveweight 24 hours post-calving	(kg)	344.4	380.2	425.3	7.4	B,C > A**,C > B**
Dam liveweight gain 24 hours post-calving to 28.i.72	(kg/d)	0.49	0.33	0.29	0.03	A > B**,A > C**
Calf liveweight gain birth to 3.xi.71	(kg/d)	0.45	0.68	0.73	0.05	B > A**,C > A**
Calf liveweight gain 3.xi.71 to 26.i.72	(kg/d)	0.65	0.87	0.89	0.06	B > A**,C > A**
Calf weaning weight 15.v.72	(kg)	160.4	219.2	229.0	14.2	B > A**,C > A**
Week of conception when remated	(week)	5.3	5.0	3.0	0.07	A,B > C*
Calving to conception interval	(days)	86.0	81.9	69.6	5.0	N.S.

*P < 0.05 **P < 0.01

of Treatment A heifers suggested that heifer mortalities might well have occurred had the dietary restriction been any more severe over the 12 weeks.

The calving period was 39 days in duration. Dystocia occurred only in Treatment A where four calves and two heifers died during calving. The three dystocia-affected heifers appeared to calve with insufficient effort and endurance. A fourth heifer calved unaided, but delivered a dead calf. Pelvic dimensions of heifers were similar between treatments. Treatment A calves were non-significantly smaller and weighed less at birth than the other treatments.

Calf birth weight was significantly correlated with dystocia incidence ($b = 0.023 \pm SE_b\ 0.009$) ($P < 0.05$). Heavier calves required more assistance. However, calf birth weight was not related to the likelihood of stillbirth. Calf birth weight was significantly correlated with all calf body measurements ($P < 0.01$).

There was no significant correlation between pelvic area and the incidence of either dystocia or stillbirth.

All heifers gained liveweight on the favourable post-calving nutritional regime. Liveweight means of Treatment A calves were significantly inferior to the other treatments at all weighings ($P < 0.01$). Liveweight changes were similar for Treatment B and C calves. Although the calculated calving to conception interval for lactating heifers in Treatment C was 69.6 days compared with 86.0 and 81.9 (± 5.0) days for Treatments A and B respectively, the differences were non-significant, Treatments A, B and C lactating heifers recorded final conception rates of 93.3, 95.0 and 100 per cent respectively.

IV. DISCUSSION

A number of workers have reported reduced calf birth weights in heifers following dietary restriction during pregnancy (Ryley 1961; Hodge and Rowan 1970; Young 1970). In spite of such birth weight reduction there has usually been no significant improvement in calving performance (Hodge and Rowan 1970; Young 1970). In fact Young (1968) reported that severe restriction in pre-calving nutrition might increase dystocia incidence through failure of the pelvic ligaments to relax and dilate the posterior birth canal.

In this experiment severe undernutrition during the final trimester produced small non-significant reductions in calf birth weight and size in Treatment A, but these heifers recorded inferior calving performance with respect to heifer mortality, dystocia and stillbirth. This was attributed to the detrimental effect of the dietary restriction on calving effort and endurance. For instance the two heifers in Treatment A died within four hours of the onset of calving.

Calves reared by the originally poorest-fed heifers were lightest at all weighings and recorded inferior pre-weaning growth rates ($P < 0.01$). This occurred in spite of favourable post-calving nutrition and would seem to reflect poorer lactation by their dams, resulting from pre-calving undernutrition (Bond and Wiltbank 1970). Wallace (1948) reported that pre-lambing dietary restriction severely retarded the development of foetal liver, spleen and muscle. Perhaps calves from the Treatment A heifers experienced similar retarded organ and tissue development and suffered inferior post-calving growth rates as a consequence. As predicted by Young (1970) fertility of dams was satisfactory following the provision of favourable post-calving nutrition.

It would appear that dietary restriction of three year old heifers, for the final trimester does not improve calving performance in spite of small though non-significant reductions in calf birth size. At the levels of undernutrition required to achieve reduced calf birth size, heifer calving effort and endurance appears to be adversely affected. Avoidance of excessive nutrition might have application to ensure that heifers do not calve in overfat body condition (Bond and Wiltbank 1970).

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