NATURAL BREEDING TRIALS IN BEEF CATTLE
EMPLOYING OESTRUS SYNCHRONISATION AND BIOSTIMULATION

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SUMMARY

Angus bulls were joined with 381 Angus, Chianina and cross-bred heifers in four groups at bull-to female ratios of 1:20. Group 1 (n=93) received one injection of prostaglandin prior to breeding, and groups 2 and 3 (n=97 and 99 respectively) received two injections 13d. apart. Group 3 also contained five androgenised cows from first injection to breeding. Group 4 (n=92) were controls. Bulls were admitted 1d. following the second (or only) prostaglandin injection for 70d. Pregnancy diagnosis was performed 80 and 140d. after the commencement of joining.

Gross pregnancy rate (GPR) for the entire breeding season (3 or 4 cycles) was 65.4% and for first cycle (sync and control) breeding it was 48.3% (53% and 33.7% respectively). GPR did not differ among groups at the end of the breeding season.

Net pregnancy rate (NPR) to first cycle breeding (pregnant first cycle/ pregnant overall) averaged 73.9% (treated groups = 80.5%; controls = 52.5%). Groups 1,2 and 3 achieved 1st cycle NPRs of 75.0%, 79.7% and 86.9% respectively (p < .05; p < .01; p < .001 respectively).

Natural breeding in conjunction with prostaglandin treatment in beef heifers was successful, with a two injection prostaglandin regime being more successful than a single injection regime. The synchronisation treatment enhanced cyclicity and pregnancy rates at first cycle breeding with biostimulation (presence of androgenised cows) conferring further advantage.

INTRODUCTION

Despite its potential for genetic progress, AI/synchronisation programmes (AI/sync) have not been widely used within the beef cattle industry. This lack of acceptance is mainly due to the perceived large increase in management effort (including improved facilities and management) necessary to achieve success (Beverly 1978). Synchronisation with natural breeding (bull/sync) offers an interim alternative with lesser demands on management. Such programmes can be successful using normal bull-to-female ratios, providing the bulls employed are active and fertile (Pexton and Chenoweth 1977, Chenoweth 1978, Kelly et al 1980).

The objective of this trial was to evaluate a bull/sync programme with commercial beef heifers and to compare two different prostaglandin regimes as well as the effects of biostimulation on heifer response.

MATERIALS AND METHODS

A total of 381 Chianina (n=30), Angus (n=275) and Chianina x Angus (n=76) heifers (aged 18-24 mo) were selected from a group of 650 on the basis of growth and condition score. After weighing and palpation for ovarian structures, they were randomly assigned to four groups. Group 1 received one injection of 25 mgm prostaglandin \( \text{P}_{2}\alpha (\text{Lutalyse}^R, \text{Upjohn Pty. Ltd.}) \), groups 2 and 3 received 2 injections of 25 mgm prostaglandin 13d. apart, and group 4 were controls. Five androgenised cows were included in groups 2 and 3.

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Adult cows were prior androgenised with parenteral testosterone cypionate and placed with group 3 for 13d., following the first injection of prostaglandin. Oestrus detection paint was applied to all heifers at the time of the prostaglandin injections, and paint disturbances were observed 5d. later. Twenty Angus bulls, aged 1 to 5 years, were selected on the basis of satisfactory assessments for libido and breeding soundness (including scrotal circumference measurement and semen assessment). These were placed with the heifers at a bull to female ratio of 1:20, one day following the first (group 1) or second (groups 2 and 3) prostaglandin injections. Bulls were admitted to the control group (group 4) at the same time as the other groups. Mating groups were then placed in small, easily observed, enclosures on sorghum pasture. Bulls were removed 70d. after admission. Pregnancy diagnosis was conducted on all heifers approximately 80 days and 140 days following admission of the bulls. Results were analysed by Contingency Chi-Square and by Log-linear methods. Subgroups differ slightly in numbers at different examinations due to vagaries of management.

**RESULTS**

Trial heifers averaged 287±31.3 kg liveweight and a condition score of 3.9 ±.42 at trial commencement (Table 1). Overall, 76.1% of heifers had a palpable CL and/or follicle on one or both ovaries at trial commencement. There were no differences among groups in these parameters.

Table 1 Breeding group data

<table>
<thead>
<tr>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3*</th>
<th>4</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. heifers</td>
<td>93</td>
<td>97</td>
<td>99</td>
<td>92</td>
<td>381</td>
</tr>
<tr>
<td>Treatment</td>
<td>1xPCF$_{2\alpha}$</td>
<td>2xPCF$_{2\alpha}$</td>
<td>2xPCF$_{2\alpha}$</td>
<td>control</td>
<td>-</td>
</tr>
<tr>
<td>Weight (kg±SD)</td>
<td>279±37.6</td>
<td>284.2±24.1</td>
<td>292.6±21.7</td>
<td>282.6±29.0</td>
<td>287±31.3 (NS)</td>
</tr>
<tr>
<td>Condition Score (±SD)</td>
<td>4.0±.5</td>
<td>3.9±.4</td>
<td>3.9±.4</td>
<td>3.8±.3</td>
<td>3.9±.4 (NS)</td>
</tr>
<tr>
<td>'Active ovaries' (follicle)</td>
<td>81.6%</td>
<td>71.0%</td>
<td>71.9%</td>
<td>80.0%</td>
<td>76.1% (NS)</td>
</tr>
</tbody>
</table>

*5 androgenised cows with group for 14 days prior to breeding

NS=non significant differences among groups

Five days following their first prostaglandin injection, 60.8% of treated heifers (groups 1,2 and 3) showed paint disturbances (67.2%, 52.6% and 63.0% respectively) with group 2 showing slightly less response (p <.05) than the other groups. (Table 2). Control heifers showed 15.8% paint disturbances over the same period, compared with an expected frequency of approximately 20% in a fully cycling group.

Five days following their second prostaglandin injection, 71.6% of treated heifers (groups 2 and 3) showed paint disturbances (61.7% and 81.4% respectively) with a significant difference in favour of group 3 (p <.01). This represented an increase in apparent cyclicity from the first to second prostaglandin injection of 9.1% (8 heifers) in group 2, and of 18.4% (16 heifers) in group 3.
Gross pregnancy rate to the synchronised (five-day) breeding (groups 1, 2, and 3) averaged 53% (48.4%, 56.7% and 53.5% respectively). The equivalent first cycle (21 day) pregnancy rate in the control group was 33.7%. Groups 1, 2, and 3 did not differ among themselves, but, collectively, they differed from the control group ($p < 0.0001$). For the entire breeding season (4 cycles in sync groups, 3 cycles controls), gross pregnancy rate was 65.4% (64.5%, 71.1% and 61.1% and 64.1% respectively) with no differences occurring among groups.

Net pregnancy rate is calculated on the basis of number of females which became pregnant throughout the entire breeding season (including both synchronised and natural cycles). On this basis, net pregnancy rate to the synchronised breeding (groups 1, 2, and 3) was 80.5% (75.0%, 79.7% and 86.9% respectively), whilst in the control group, the equivalent rate (first cycle) was 52.5%. Overall net pregnancy rate to first cycle breeding was 73.9%. Groups 1, 2, and 3 differed from the controls ($p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively).

Of those heifers showing paint disturbances following one injection of prostaglandin, 62.0% became pregnant. Within the synchronised groups, 73.8% of females with 'active' ovaries at trial commencement became pregnant at the synchronised oestrus with no differences occurring among groups.

Table 2 Responses in heifer groups

<table>
<thead>
<tr>
<th>Response</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paint disturbances (5d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 x PGF$_2$$_0$ (%)</td>
<td>67.0$^a$</td>
<td>52.6$^b$</td>
<td>63.0$^a$</td>
<td>60.8</td>
<td></td>
</tr>
<tr>
<td>2 x PGF$_2$$_0$ (%)</td>
<td>-</td>
<td>61.7$^a$</td>
<td>81.4$^c$</td>
<td>71.6</td>
<td></td>
</tr>
<tr>
<td>Controls (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.8</td>
</tr>
<tr>
<td>Gross pregnancy rate overall (%)</td>
<td>64.5</td>
<td>71.1</td>
<td>61.1</td>
<td>64.1</td>
<td>65.4</td>
</tr>
<tr>
<td>Gross pregnancy rate first cycle</td>
<td>48.4$^a$</td>
<td>56.7$^a$</td>
<td>53.5$^a$</td>
<td>53.7$^c$</td>
<td>40.3</td>
</tr>
<tr>
<td>Net pregnancy rate first cycle (%)</td>
<td>75.0$^b$</td>
<td>79.7$^c$</td>
<td>86.9$^d$</td>
<td>52.5$^a$</td>
<td>73.9</td>
</tr>
</tbody>
</table>

$a, b, c, d =$ superscripts in rows differ

$\ a, b = p < 0.05$

$\ a, c = p < 0.01$

$\ a, d = p < 0.001$

**DISCUSSION**

This trial indicated that oestrus synchronisation with prostaglandin in a large group of beef heifers yielded satisfactory results when natural breeding was employed.

Although gross pregnancy rates were not optimal, this reflects the adverse environmental conditions under which these heifers were raised, with growth and condition being barely satisfactory at commencement of the trial. It can be assumed that approximately three quarters of the heifers were cycling based on the estimate of heifers with 'active' ovaries pre-trial and paint disturbances following two injections of prostaglandin (76.1% and 71.6% respectively).
Three major conclusions can be made from these results. Firstly, the combination of oestrus synchronisation with prostaglandin and bull breeding yielded pregnancy results superior to most reports on trials using prostaglandin regimes in conjunction with AI to breed heifers (Manns and Hafs 1976, Motlik et al 1976, Britt et al 1978). This is perhaps not surprising when one considers that natural breeding has advantages of biostimulation, larger semen doses and multiple services in comparison with AI. In this trial, a two injection regime of prostaglandin proved superior to a one injection regime.

Secondly, the synchronisation procedures appeared to enhance cyclicity (and associated fertility) in treated heifers when first cycle pregnancy rates were compared with controls. This observation gains further credence by the loss of such advantage by the end of the breeding season. The reason for such a boost by the synchronisation procedure is not apparent when physiological mechanisms are considered and it may have been influenced by the extra handling received by the treated heifers or by allelomimetric stimulation. On the other hand, it is at least equally possible, that the prostaglandin itself conferred some undefined boost to heifer response.

Thirdly, the presence of androgenised cows as ‘biostimulators’ provided an additional boost to synchronised heifer response, based on paint disturbances following the second prostaglandin injection and net pregnancy rate to first cycle breeding.

ACKNOWLEDGEMENTS

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REFERENCES