ARTIFICIAL INSEMINATION IN A BEEF HERD IN NORTH QUEENSLAND

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Summary

A herd of 444 Shorthorns, comprising 376 cows (92 lactating) and 68 heifers, were bred by artificial insemination under extensive grazing conditions in north Queensland.

First service conception rate was higher in dry cows than in lactating cows (51 per cent v. 30 per cent) and higher in cows than in heifers (47 per cent v. 31 per cent).

Pregnancy rate was influenced by lactation (87 per cent of dry cows pregnant *v.* 51 per cent of lactating cows) and age (79 per cent cows pregnant v. 65 per cent in heifers).

All dry cows were detected in oestrus but 14 per cent of lactating cows failed to show oestrus at all. A proportion of lactating cows, though not conceiving to first service, were not again detected in oestrus. Nutritional stress is postulated as the cause of this post-service anoestrus.

I. INTRODUCTION

Artificial insemination has been widely accepted in the dairying industry throughout the world, but has been applied on a more limited scale in the beef industry. Its value is in the control of certain infertility problems and the utilisation of sires of high genetic merit.

In Queensland, Lamond and Takken (1966) and Donaldson and Larkin (1966) used artificial insemination with beef animals showing natural oestrus. Barr, Rowan and Plasto (unpublished data) used it during oestrus synchromisation trials. In all cases, difficulties associated with oestrus detection and with management of large groups of cattle for artificial insemination have been reported.

II. MATERIALS AND METHODS

(a) The Property

The work was carried out at "Swan's Lagoon" Cattle Field Research Station, Millaroo, which is 160 km south-west of Townsville. The climate and vegetation of the region have been described by Christian and Slatyer (1953).

(b) Cattle Handling Facilities

Two paddocks, each of 500 ha, close to cattle yards, were used for grazing cattle during the insemination period. They were well watered and carried a good bulk of grass. The cattle yards contained a large receiving yard, shade trees- and were provided with water. A roofed cattle crush was installed at the end of a race for the inseminations.

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(c) ***Cattle***

Prior to the commencement of artificial insemination, the herd was used to investigate reproductive performance under natural mating (Plasto 1968; Plasto and Strachan 1970). With the discovery of trichomoniasis and vibriosis in the herd, four years of natural mating ceased on February 1, 1967. Artificial insemination was used in a pilot study until May 1967.

From mid-December 1967 to mid-June 1968, a herd of 444 Shorthorn cows, including 68 two-year-old heifers and 92 lactating cows were available for artificial insemination. The lactating cows were included in the artificial insemination group approximately three months after calving. The majority of these lacating cows had been mated by artificial insemination in 1967. All cows in this programme had been isolated from bulls for a minimum of ten months.

At the beginning of the artificial insemination season, the dry cows were in good store to forward store condition and gaining weight. Pregnant cows calved in forward store and fat condition but had declined to store and forward store condition respectively by the time they were included in the artificial insemination group. These levels of body condition were generally maintained until the end of the programme.

At the conclusion, of the programme, all non-pregnant cows were slaughtered, uteri collected and laboratory examinations made for vibriosis and trichomoniasis, with negative results.

(d) ***Insemination*** *Programme*

(i) Handling *of* ***cattle***

The size of the artificial insemination group varied from 150 to ***280*** cattle during the season. The cattle were rotated between the two paddocks as required. The programme was divided into two sections. In the first section (from mid-December to mid-April), cattle were mustered daily for oestrus observation and held in the yards from 8 a.m. to 5 p.m. The mustering was completed by 8 a.m. to avoid working cattle in high temperatures. Visual observations of oestrus were made morning and afternoon. The accepted criterion for oestrus was standing for mounting by other cows.

Cows showing oestrus in the morning were identified and inseminated in the afternoon, and cows on heat in the afternoon were inseminated next morning. The latter were paint branded for easy identification when yarded on the day following detection.

In the second phase (from mid-April to the end of June), heat detectors (Baker 1965) were used for oestrus observation. The cows were inspected in the paddock every morning, and cows which had triggered the detector were yarded, inseminated before 10 a.m. and returned to the paddock.

Cows which did not exhibit oestrus again within 28 days following insemination were removed from the group. Pregnancy diagnosis was carried out six to eight weeks after insemination and any non-pregnant cows were returned to the group.

(ii) Semen supply

Chilled and deep frozen semen were both used. Two Shorthorn, two Brahman, and a Sahiwal bull were maintained for the supply of semen.

Semen for chilling was collected three times a week by electro-ejaculation (Watson 1964), and diluted with egg yolk-citrate (equal volumes of egg yolk and 3 % sodium citrate plus 1000 units per ml of diluent of sodium penicillin and streptomycin) to a count of approximately 50 million sperm per ml. All semen collections were examined for density, motility and sperm count. Live/dead ratios were checked regularly. Only semen judged as satisfactory by these methods of appraisal was used.

Some collections were air-freighted to the A.I. Centre, at Wacol, near Brisbane, after preliminary dilution and processed there by a standard deep-freezing technique (Singleton 1970). This semen was placed in liquid nitrogen containers and returned to Swan's Lagoon for use in the programme. When sufficient supplies of deep frozen semen had been accumulated, the processing of chilled semen was discontinued.

III. RESULTS

The first service conception rate was 44 per cent for all individuals, and cows demonstrated higher fertility compared with heifers (47 per cent v. 31 per cent). A marked reduction in fertility occurred after two inseminations (Table 1).

Conception rates were influenced in inseminated cows by lactation. In terms of first service conception, there was a significant ($P < 0.05$) reduction in the fertility of lactating cows (51 per cent v. 30 per cent) (Table 1).

Of the 444 cows and heifers, 431 were detected in oestrus and inseminated at least once. Thirteen (14 per cent) of the lactating cows were not observed in oestrus at any time. Seventy seven per cent of all animals inseminated conceived. A significantly higher ($P<0.05$) pregnancy rate was obtained in cows than in heifers (79 per cent v. 65 per cent) (Table 2).

The pregnancy rate of -dry cows was higher than lactating cows. Of the cows inseminated, 87 per cent of the 284 dry cows and 51 per cent of the 79 lactating cows conceived ($P<0.05$) (Table 2).

More cattle were detected in oestrus by visual observation than by the use of heat detectors (89 per cent v. 8 1 per cent) in the first 24 days of each period. However, the relative effectiveness of the two methods was not critically compared as they were used at different periods.

IV. DISCUSSION

Several systems of mating have been used at "Swan's Lagoon" Cattle Field Research Station over a period of years. Both natural service and artificial insemination have been employed in a limited mating period, while a system of year-round mating has been used with natural service.

The most efficient method in terms of pregnancy rate has been all-year mating using natural service, an average of 83 per cent of cows having been detected pregnant annually over a four year period (Plasto, unpublished data). Using a limited nine-week mating period, the average pregnancy rate was 63 per cent (Plasto 1968). Artificial insemination resulted in a pregnancy rate of 74 per cent.

In comparison with other workers, Donaldson and Larkin (1966) and Lamond and Takken (1966), results achieved in this trial were of a high order.

TABLE 1

Conception rates per insemination

Insemination	All Cattle	Pregnant %	No. of Heifers	Pregnant %	No. of Cows	Pregnant %	No. Cows Lactating	Pregnant %	No. Cows Dry	Pregnant %
1st	431	44	68	31	363	47	79	30	284	51
2nd	224	43	47	30	177	46	39	33	138	50
3rd	115	19	33	21	82	18	13	23	69	17

TABLE 2

Pregnancy rates all ***inseminations***

	No. in Group	No. Detected in Oestrus and Inseminated	Pregnant	
			to Inseminations	of Total No.
Cows	376	363	79	76
Heifers	68	68	65	65
Total	444	431	77	74
Lactating	92	79	51	43
Non lactating	284	284	87	87

Those authors reported pregnancy rates of 16 per cent to 39 per cent using artificial insemination in trials involving naturally occurring oestrus extending over a six weeks mating period, i.e. allowing time for approximately two inseminations if necessary. In the former trial vibriosis was one cause of lower fertility. In this trial, 65 per cent of cattle were pregnant after two inseminations. This difference could possibly be attributed to the inclusion of a high proportion of non-lactating cows. Infectious infertility diseases are not considered to have effected the results of this trial.

The pregnancy rates obtained in heifers were comparatively low (65 per cent) after one to three inseminations. Donaldson and Larkin (1966) reported a pregnancy rate of 29 per cent in Brahman cross bred heifers over a six-week period, with a first service conception rate of 20 per cent. The first service conception rate in heifers in this trial was only 31 per cent. Donaldson and Larkin (1966) obtained positive reactions to tests for vibriosis in the heifers concerned, but the heifers in this trial had no contact with bulls during their life time. Twenty heifers, contemporaries of these, were tested three times, at weekly intervals, for vibriosis and trichomoniasis with negative results. There is no ready explanation for the poor performance of the heifers in this trial.

Reduced fertility in lactating cattle in northern Australia has been well documented, a recent reference being Lamond (1969). It is worthy of note that in the present trial, reduced first and second service conception rates were present, in addition to a lower incidence of oestrus in lactating cows, indicating that the lower pregnancy rate in this group was due to a combination of factors.

Infertility, apparently due to malnutrition and lactation stress, in dairy cows during early lactation has been demonstrated by McClure (1965). McClure (1968) reported a nutritional infertility syndrome in lactating dairy cows grazing pastures which was short, rapidly growing and consisting of grass or green oats. In both cases the exact nature of the malnutrition was unknown. Wiltbank et al. (1962, 1964) have demonstrated the importance of energy level on reproductive performance. It seems probable that the level of nutrition for lactating cows in this trial was marginal in relation to their requirements for reproduction. Some lactating cows failed to demonstrate oestrus at all (14 per cent), while 30 per cent of the non-pregnant lactating cows failed to return to service after the first insemination, indicating a possible occurrence of post-service anoestrus.

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