Proc. Aust. Soc. Anim. Prod. (1974) **10**; 33

EFFECT OF AGE, BREED OF DAM, AND BREED OF SIRE ON PREGNANCY RATES

T.H. RUDDER*, G.W. SEIFERT** and J.W. LAPWORTH***

Summary

Data from a commercial herd in Central Queensland showed that age of cow had a significant effect on pregnancy rates. Selection appears effective in improving pregnancy rates. Lactation stress appears to be important in 2-yr-old lactating cows.

Breed-or-sire effect was significant. However, comparisons may have been confounded by selection and environmental effects.

There was no breed of dam effect within the range of genotypes observed. Prior selection may have been partly responsible.

I. INTRODUCTION

Research work at the National Cattle Breeding Station, "Belmont", has shown that inter-se mating of Brahman x British cattle results in a decline in fertility which is not apparent in Africander x British inter-se mated cattle (Seifert and Kennedy 1972). Barr (1971) reported a decline in fertility as Brahman component increased. These trends are in general agreement with American work (Cartwright et al. 1964; Schilling and England 1968; Kidder et al. 1964; Reynolds 1972).

The effect of age of cow on fertility is usually reflected in lower pregnancy rates in 2-yr-old and 3-yr-old lactating cows. This is generally attributed to susceptibility to nutritional stress (Barr 1971). However, the effect on fertility of selection by the removal of sub-fertile cows has usually not been considered.

The purpose of this paper is to report initial results concerning the effect of breed and age of pregnancy rates.

II. MATERIALS AND METHODS

Data from two mating seasons were collected from a trial using a commercial beef herd on "Mt Eugene". This property is approximately 50 km south of Rockhampton and 72 km southwest of Gladstone. Long term rainfall in the area averages 674 ± 135 mm annually, with 486 ± 123 mm being received during November to April and 188 ± 70 mm during May to October.

The land system used for the breeding herd is Torsdale (Speck et al- 1968). Timber treatment has resulted in a grassy woodland with Eucalyptus crebra, E. tessallaris and E. polycarpa in a pasture of Heteropogon sp., Bothriochloa sp. and Dicanthium sp. This type of pasture is stocked at 4.0 to 4.5 ha per breeding unit, depending on seasonal conditions.

Three groups of mixed-age breeders varying in Brahman component were mated to 4 Belmont Red bulls, 4 Droughtmaster bulls and 2 selected Santa Gertrudis bulls. Mating intensity was approximately 25 and 30 cows per bull in 1971/72 and 1972/73 respectively. The three groups of

* Beef Cattle Husbandry Branch, Q.D.P.I., Rockhampton, Qld, 4700.
** Division of Animal Genetics, C.S.I.R.O., Rockhampton, Qld, 4700.
*** Beef Cattle Husbandry Branch, Q.D.P.I., Biloela, Qld, 4715.

breeders contained similar proportions of each age group and each genotype, i.e. H^6B^2, H^5B^3, B^4H^4, and B^5H^3, where the superscripts indicate the breed component (Brahman and Hereford) and the first letter the cow's sire.

The Belmont Red and Droughtmaster bulls were 2- and 3-yr-old at the commencement of the first and second mating season, respectively. The Santa Gertrudis bulls were 3 years older, in addition they had been selected for fertility by means of test matings. All bulls used had satisfactory semen quality according to the method of Watson (1964) which uses collection of semen by electro-ejaculation, and evaluation on the basis of colour, density, motility and live-dead ratio

Pregnancy was determined by rectal palpation 8 weeks after the termination of mating. Estimated foetal age was recorded on the basis of 1 = non-pregnant, 2 = 16 weeks or less, 3 = greater than 16 weeks (early conception). Pregnancy rates were analysed by least squares method (Harvey 1960) using the following model:-

Model 1

$$X_{ijklm} = \mu + Y_i + B_j + S_k + A_l + (BS)_{jk} + (BA)_{jl} + (SA)_{kl} + \beta^1 W_{ijklm} + \beta^2 D_{ijklm} + \beta^3 C_{ijklm} + e_{ijklm}$$

where:

X_{ijklm} = pregnancy rate

μ = overall mean with equal subclass numbers

Y_i = year (i = 1,2)

B_j = breed of cow (j = 1,2)

S_k = breed of sire (k = 1,2, ... 5)

A_l = age of cow (l = 1,2, ... 5)

$(BS)_{jk}$ = the interaction effect of the j^{th} breed of cow by k^{th} breed of sire

$(BA)_{jl}$ = the interaction effect of j^{th} breed of cow by l^{th} age of cow

$(SA)_{kl}$ = the interaction effect of k^{th} breed of sire by l^{th} age of cow

β^n = partial regression of pregnancy rate on n = 1 = weight of cow, n = 2 = age of calf, n = 3 = weight of calf

W_{ijklm} = weight of the m^{th} cow

D_{ijklm} = age of the m^{th} calf

C_{ijklm} = weight of the m^{th} calf

e_{ijklm} = random errors. Assumed to be NID (O, e^2)

Because calf weights and ages were included, maiden heifers were excluded.

Model 2

The data were also analysed with the maiden heifers included and the partial regressions involving calf weight and age excluded.

III. RESULTS AND DISCUSSION

Table 1 gives the analysis of variance for both models, while Table 2 gives the least squares constants for the significant effects.

TABLE 1

Analyses of variance for pregnancy rates

Source of variance	Model 1		Model 2	
	D.F.	M.S.	D.F.	M.S.
Years (Y)	1	0.482	1	0.329
Dam breed (D)	1	0.002	1	0.006
Sire breed (S)	2	1.386**	2	0.703
Age of cow (A)	4	0.541	5	0.836*
D x S	2	0.511	2	0.596
S x A	8	0.153	10	0.294
D x A	4	0.396	5	0.157
Regr (Cow wt)	1	0.155	1	1.336*
Regr (Calf age)	1	5.354**		-
Regr (Calf wt)	1	0.023	-	-
Error	289	0.265	464	0.319

** P = < .01   * P = < .05

TABLE 2

Least squares constants for breed of sire and age of dam effects

	Model 1	Model 2
Overall mean	1.383	1.986
Breed of sire:		
Santa Gertrudis	0.168	0.109
Droughtmaster	-0.031	-0.023
Belmont Red	-0.137	-0.086
Age of dam:		
1 yr		-0.154
2 yr	-0.199	-0.212
3 yr	-0.064	-0.007
4 yr	-0.028	-0.013
5 yr	0.144	0.193
6+ yr	0.147	0.196

Breed of dam effects were not significant and this was probably because higher Brahman component and inter-se mated breeders were not present. But, the effect of prior selection through removal of non-pregnant cows each year may be pertinent. Selection policy should be considered when comparing different breeders for fertility.

Breed-of-sire effects were highly significant in Model and the constants showed the same trend in Model 2. The Santa Gertrudis were selected on fertility and may not have been representative of the breed.

Age of dam constants showed a similar trend in both Models. The decline in pregnancy rates from 1- to 2-yr-old indicates that lactation stress can be important in 2-yr-old cows. This is consistent with published data (Temple 1966). The increase in pregnancy rate with age in a herd where culling non-pregnant females is rigorously adhered to suggests that culling non-pregnant cows is successful in improving pregnancy rates. This is consistent with reports which suggest that the repeatability of reproduction is high enough to recommend culling cows that fail to conceive (Temple 1966).

Simple correlations between cow weight and pregnancy rate were similar in both models ($r_I = .242$, $r_{II} = .258$, $P < .01$). In Model 2 the partial regression on cow weight ($b = 0.0006 \pm 0.003$) was significant, while in Model 1 it was not significant ($b = 0.0003 \pm 0.0004$). The reason for this may have been that the other regression fitted in Model 1 (calf age and calf weight) were positively correlated to cow weight ($r = 0.508$ and $r = 0.027$) and removed a large part of the variation.

The partial regression on calf age ($b = 0.0029 \pm 0.0011$) was highly significant and is purely a reflection of the time after calving cows become pregnant. Cows which calved early in the season became pregnant earlier than those which calved later, which is largely a reflection of post-partum anoestrus as well as seasonal conditions.

IV. ACKNOWLEDGEMENTS

The authors wish to thank Mr P. Maynard, "Mt Eugene", Jambin, for his co-operation which allowed this work to be done, and Messrs Bean, Beasley and Short for their assistance in collating the data. Thanks are also due to Mr Hodge who undertook the pregnancy diagnosis, and to colleagues for their help, advice and criticism in compiling this paper.

V. REFERENCES

BARR, N.C.E. (1971). "Reproduction in Queensland Beef Cattle". (Queensland Department of Primary Industries: Brisbane).

CARTWRIGHT, T.C., ELLIS, G.F., KRUSE, W.E. and CROUCH, E.K. (1964). "Hybrid Vigor in Brahman-Hereford Crosses". Texas A. & M., Tech. Monograph 1. May, 1964.

HARVEY, W.R. (1960). U.S.D.A., A.R.S. Bul. 20-8.

KIDDER, R.W., KOGER, M., MEADE, J.H. and CROCKETT, J.R. (1964). "Systems of Crossbreeding for Beef Production in Florida". Uni. of Florida Bulletin 673, May, 1964.

REYNOLDS, W.L. (1972). "Improving Reproduction Efficiency in Beef Cattle". Proc. of 21st and 22nd Beef Cattle Short Course. Texas A. & M., 1972, p.208.

SCHILLING, P.E., and ENGLAND, N.C. (1968). J. Anim. Sci. 27: 1363.

SEIFERT, G.W., and KENNEDY, J.F. (1972). Proc. Aust. Soc. Anim. Prod. 9: 143.

SPECK, N.H., WRIGHT, R.L., SWEENEY, F.C., NIX, H.A. and PERRY, R.A. (1968). Land Research Series C.S.I.R.O. Australia. No. 21: 59.

TEMPLE, R.S. (1966). "Reproduction of Beef Cattle in the South". U.S.D.A. Southern Co-op. Series Bulletin 118, Dec., 1966.

WATSON, J.W. (1964). Aust. vet. J. 40: 183.