S. Afr. J. Anim. Sci. 9, 205–208 (1979)

CROSSBREEDING WITH AFRICANDER DAM AS BASIS. 2. WEANING PERFORMANCE OF PROGENY OF VARIOUS SIRE BREEDS

Receipt of MS 19-04-1979

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(Key words: *Cattle, crossbreeding, weaning mass)*
(Sleutelwoorde: *Beeste, kruisteling, speenmassa)*

OPSOMMING: KRUISTELING MET AFRIKANERKOEI AS BASIS : 2. SPEENPRESTASIE VAN NAGESLAG VAN VERSKILLENDE VAARRASSE

Speenmassa van 753 kalwers, afkomstig uit Afrikanerkoeie en Afrikaner-, Brahman-, Charolais-, Hereford- en Simmentalerbulle, is bestudeer. Kruisgeteelde kalwers het tussen 11,1 persent en 11,8 persent beter presteer as Afrikanerkontroles. Charolaiskruise het betekenisvol groter speenmassas gehad as Hereford- en Simmentalerkruise met Brahmankruise in 'n intermediêre posisie. Deur egter voetstoots teen alle distokiegevalle te diskrimineer, was die netto speenmassa opbrengs per koei gekalf van die Simmentaler-, Brahman- en Herefordbulle aansienlik beter as dié van Charolais- en Afrikanerbulle.

SUMMARY:

Weaning mass was studied for 753 calves out of Africander cows by Africander, Brahman, Charolais, Hereford and Simmentaler sires. Crossbreds performed 11,1 per cent to 11,8 per cent better than Africander controls. Charolais progeny had a significantly greater weaning mass than Hereford and Simmentaler progeny with Brahman progeny in an intermediate position. When all cases of dystocia were taken into consideration, however, the net weaning mass output per cow calved for Simmentaler, Brahman and Hereford bulls was considerably better than that for Charolais and Africander bulls.

The production of a weaner calf, whether for immediate marketing or for subsequent growing out or breeding, can be considered as the initial phase in the production cycle of beef in extensive beef cattle farming. The importance of the reproduction phase in the beef production cycle is evident from the estimate that 52 per cent of all nutrients can be allocated to the cow and calf to weaning, 32 per cent for fattening weaners and 16 per cent for the rearing of replacements (Harwin & Lombard, 1974).

In the extensive beef cattle areas of South Africa an average of eight to twelve hectares of grazing is required per cow for the annual production of a weaner calf. Thus, the value of the weaner must compensate for the interest on capital outlay to carry one cow unit plus redemption and production costs to produce the weaner. Efficiency of beef production is, therefore, largely dependent on the production of the optimum number and mass of weaner calves per hundred cows at a reduced cost per breeding unit.

Selective crossing of beef breeds can materially contribute to the achievement of this aim as shown by Smith, Laster and Gregory (1976), but it is most important to maintain a correct perspective of the biological implications of increasing preweaning growth and thus bull-breeds should be evaluated in the light of acceptable limits of their progeny's growth performance and related information (Smith *et al.*, 1976; Barlow, 1978). In view of these considerations the weaning performance of progeny obtained by employing various sire-breeds with the Africander as dam was evaluated.

Procedure

Material

The origin of the experimental animals has been described by Mentz, Coetzer and Els (1975) and is the progeny of Africander cows bred to Africander, Brahman, Charolais, Hereford and Simmentaler bulls at Vaalharts Agricultural Research Station.

Management

During the weaning season of approximately three months (May, June, July and August) the cow-herds

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were brought into handling units every fortnight to identify calves due to be weighed and/or weaned. When a calf reached the age of 210 days during a 14-day period, it was weighed at the beginning and end of each period. From these data the 210-day interpolated mass of each calf was calculated. Calves were weighed in the early morning after having been isolated from their dams during the night. The calves were weaned on the day of the second weighing.

Statistical analysis

The data were subjected to regression analysis by least squares procedures (Harvey, 1960). The model included the effects of sire-breed, production status/age of cow, year, sex and order of birth. Only first order interactions were considered. Least significant differences, at the 5 per cent level, were calculated by the method of Scheffe (Miller, 1966).

Discussion of results

From the results given in Table 1, it is clear that all main effects were highly significant. The significant interaction between sex and order of birth is inexplicable while the interaction between year and order of birth may be ascribed to the variation in the nutritional status of the grazing between years. The interaction between sire-breed and year is illustrated in Fig. 1 which shows a striking variation in the relative position of especially the Simmentaler progeny. This tendency can be explained by the fact that a new set of bulls for each breed was used for breeding each year.

Table 1

Mean squares for weaning mass

Source	df	Mean squares
Sire breed (SB)	4	10 379**
Production status/age of cow (PSA)	6	2 651**
Year	4	8 933**
Sex	1	7 578**
Order of birth (Order)	2	6 398**
SB x PSA	24	251
SB x Year	16	656*
SB x Sex	4	450
SB x Order	8	191
PSA x Year	24	463
PSA x Sex	6	375
PSA x Order	12	78
Year x Sex	4	645
Year x Order	8	982**
Sex x Order	2	1 780**
Error	337	329
Residual (higher order interaction)	290	946**

* $p < 0,05$ ** $p < 0,01$

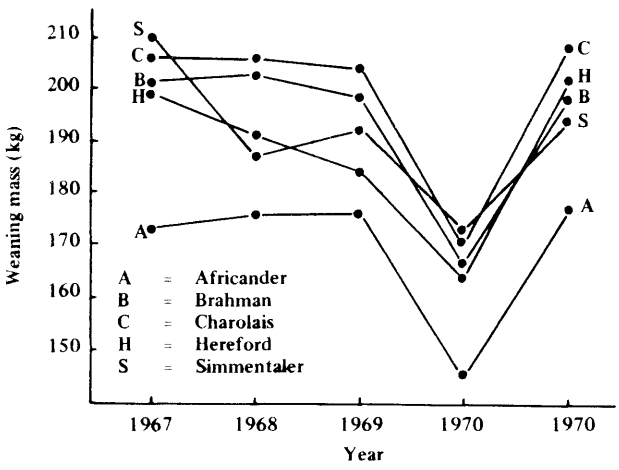

Fig. 1 Interaction between sire-breed and year for weaning mass

Table 2 shows the least squares means for weaning mass and the effect of the individual factors. It is most striking that an increase in weaning mass of from 11,1 per cent up to 11,8 per cent was obtained by crossing the Africander with any of the four exotic breeds involved. As was expected, the Charolais crosses performed especially well (Mentz, Coetzer, Vermeulen & Coetzee, 1974; Smith *et al.*, 1976) and weaned significantly better than the Hereford and Simmentaler crosses. The relative effect of the various sire-breeds on weaning mass followed the same trend as in the case of birth mass (Mentz *et al.*, 1975). This result is a logical confirmation of the relationship which exists between birth and weaning mass *per se*, as documented by Preston & Willis (1970) and Barlow (1978). However, the prominent difference between the Charolais and Simmentaler progeny is not in agreement with the results of Smith *et al.* (1976).

For a realistic interpretation of the results, the gross weaner production per cow calved per bull-breed, the commercial value of such calves and the effect of sire-breed on the subsequent fertility of the cow should have brought into consideration. Due to the somewhat extensive nature of the investigation, control on all information desired was not achieved. Thus, no commercial value was placed upon each kilogram of weaner produced per bull-breed. Furthermore, it was not possible to study the effect of sire-breed on the reproductive ability of the cow as artificial insemination was partly

Table 2

Least square means for weaning mass (kg) and the effect of each individual factor

Independent variables	n	Least squares means*	Effect
Overall mean	753	188,7	–
Sire breed			
Africander	202	$169,8^{a}$	–18,9
Brahman	132	$193,5^{bc}$	4,8
Charolais	143	$199,6^{b}$	10,9
Hereford	110	$188,5^{c}$	– 0,2
Simmentaler	166	$192,0^{c}$	3,4
Production status**/age of dam			
Heifer; 3 years (yr)	115	$178,4^{a}$	–10,3
Heifer; 4yr	60	$181,5^{a}$	– 7,2
Lactating; 4 yr	35	$184,5^{ab}$	– 4,2
Lactating; 5 to 8 yr	223	$190,5^{b}$	1,8
Lactating; 9 to 12 yr	84	$188,4^{b}$	0,2
Dry; 5 to 8 yr	175	$197,6^{c}$	8,9
Dry; 9 to 12 yr	61	$199,9^{c}$	11,2
Year			
1967	108	$198,2^{a}$	9,5
1968	215	$192,7^{a}$	4,0
1969	160	$192,5^{a}$	3,8
1970	147	$164,1^{b}$	–24,6
1971	123	$195,8^{a}$	7,2
Sex			
Female	370	$183,7^{a}$	– 5,0
Male	383	$193,6^{b}$	5,0
Order of birth			
Early	194	$195,9^{a}$	7,2
Intermediate	312	$191,2^{b}$	2,5
Late	247	$178,9^{c}$	– 9,8

*Means within each factor that do not have at least one common superscript differ significantly ($p < 0,05$).

**Description of dam previous to calving.

applied and with very unsatisfactory results (Coetzer, Mentz, Vermeulen & Coetzee, 1975). With regard to the fertility of cows, it is well known that fertility is detrimentally affected by dystocia and the production of heavy calves (Brinks, Olson & Carroll, 1973; Laster, Glimp, Cundiff & Gregory, 1973; Smith *et al.*, 1976; Barlow, 1978). Therefore in order to place the results of this investigation into better perspective, it was decided to adjust for the effects of dystocia (Mentz *et al.*, 1975), and to compare the net weaner output per cow for the various sire-breeds. The results of these calculations are as follows:

Africander controls	:	164,7 kilogram per cow
Brahman crosses	:	177,6 kilogram per cow
Charolais crosses	:	167,7 kilogram per cow
Hereford crosses	:	174,0 kilogram per cow
Simmentaler crosses	:	178,8 kilogram per cow.

It is evident that there was very little difference in the net weaner production of the Brahman, Hereford and Simmentaler crosses and that these crosses produced considerably more weaning mass than the Charolais crosses. There was also very little difference between the latter and the Africander controls in this respect.

In conclusion it may be postulated that the preweaning performance of calves is by no means the only norm by which the potential of various breeds for crossbreeding with the Africander as well as their ultimate usage in crossbreeding systems can be evaluated. Indeed, the approach should be to eliminate unfavourable breed combinations which result in calves that are too growthy and thereby cause heavy calf losses, management problems and depressed herd fertility, rather than to place too much emphasis on weaning mass *per se*.

Acknowledgement

The authors are indepted to Mr. J.A. Vermeulen and Mr. J.E. Coetzee for their invaluable technical assistance during this study.

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