Short Communications

Influence of first calving age and nutrition on the performance of early mated Nguni heifers

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The effect of early mating on the production and reproductive ability of Nguni heifers was investigated. One group (MN group) of heifers (n = 15) was stall-fed from weaning and mated at approximately 13 months of age. The second group (CN group) (n = 30) was reared on veld and first mated at approximately 15 months of age. Calving percentages of 73.3 and 75.9 were achieved, while the weaning percentages were found to be 66.7 and 69.0 for the two groups, respectively. Reconception rates were 83.3 and 78.3% for the MN and CN groups, respectively. Body mass of the MN and CN heifers differed significantly ($P \leq 0.01$) only after calving (286.3 vs. 315.9 kg). Birth and weaning mass of calves did not differ significantly between the two groups. Cow efficiency indices were significantly ($P \leq 0.05$) higher in the MN group compared to the CN group (2.4 vs. 2.0). It was concluded that, even with a restricted mating period of 42 days, Nguni heifers could be successfully mated at the age of 13 to 15 months. No dystocia problems were experienced.

Die invloed van vroeë paring op die produksie- en reproduksie-prestasie van Nguni-verse is ondersoek. Een groep (MN-groep) verse (n = 15) is ná speen in die stal gevoer en op ongeveer 13 maande gepaar. Die tweede groep (CN-verse) (n = 30) is op die veld gehou en op ongeveer 15 maande vir die eerste maal gepaar. Kalfpersentasies van onderskeidelik 73.3 en 75.9 is verkry, terwyl speenpersentasies onderskeidelik 66.7 en 69.0 vir die twee groepe was. Herbesetting was 83.3 en 78.3% vir die MN- en CN-groepe, onderskeidelik. Liggaamsmassa van die MN- en CN-verse het slegs na kalwing betekenisvol ($P \leq 0.01$) van mekaar verskil (286.3 vs. 315.9 kg). Geboorte- en speenmassas van die kalwers het nie betekenisvol tussen die twee groepe verskil nie. Koeidoeltreffendheidsindekse was betekenisvol ($P \leq 0.05$) hoër in die MN-groep vergeleke met die CN-groep (2.4 vs. 2.0). Daar is tot die gevolgtrekking gekom dat Nguni-verse selfs met 'n beperkte dekperiode van 42 dae suksesvol op ouderdomme 13 tot 15 maande gepaar kan word. Geen distokia probleme is ondervind nie.

Keywords: Body mass, early mating, Nguni heifers, reproduction.

Increases in production costs induce producers to mate heifers as soon as they are physiologically ready. However, a prerequisite for this practice is the maintenance of an optimum feeding level during the post-weaning growth period (Spark & Lammond, 1968; Maree & Harwin, 1971). According to Martin & Ellis (1976), it is possible to determine a target mass for each breed such that heifers between the ages of 11 and 15 months can be mated and still obtain a high pregnancy rate.

Although early mating can increase lifetime productivity of a cow (Pinney *et al.*, 1962; 1972; Dominguez *et al.*, 1985; 1991), this practice is not common for several reasons, such as dystocia, a decreased reconception rate and lower weaning masses of calves (Pinney *et al.*, 1972).

Brown (1956) reported that Nguni heifers may successfully be mated between the ages of 13 and 18 months, and proposed that the Nguni attain puberty at an earlier age and can therefore be mated successfully. Because of the advantages that early mating might entail, it was decided to test the response of Nguni heifers to early mating. Suppression of reconception in early mated heifers should be circumvented by mating them earlier than mature cows or supplementing the diet. This study therefore examined the performance of stall-fed Nguni heifers mated at approximately 13 months as compared to heifers mated two months later on natural sweetveld conditions. Performance during the second mating season under normal veld conditions was also investigated.

The experiment was carried out at the Bartlow Combine Nguni Breeding Station of the KwaZulu Department of Agriculture and Forestry, where mating of Nguni heifers at 24 months is standard procedure. Average calving percentage in the herd is 83%.

Forty-five Nguni weaner heifers were randomly divided into two groups of 15 and 30, respectively. Fifteen heifers were individually stall-fed (MN group) and given a complete balanced growth diet *ad libitum* with 10% crude protein and a metabolizable energy (ME) content of 10.5 MJ/kg DM, while 30 heifers were placed on natural sweet pasture (CN or control group). The latter group was grazed at a carrying capacity of 6 ha/LSU (large stock unit). Owing to lack of facilities, only 15 were accommodated in the MN group.

A lick, consisting of one part salt and two parts bonemeal, was supplied *ad libitum* to all heifers. The mating season of 42 days commenced on 1 December 1984 for the MN group, whilst that of the CN group commenced on 1 February 1985. The mating season of the MN group started earlier since they reached puberty earlier (Lepen *et al.*, 1991). After the mating season, the MN group was also placed on natural pasture. During the second mating season, both groups were mated during the same period, which started on 1 January 1986. Two Nguni sires of proven fertility were used in both groups and in both seasons.

Heifers were weighed at the beginning and end of the mating seasons, and after parturition and weaning. Conception, reconception and hypoplasia of the ovaries were estimated through rectal palpation. Birth and weaning masses (205 days) of calves were recorded. Calving and weaning percentages as well as mortality rates were also recorded. In addition, the birth mass (birth mass:*post partum* cow mass) and weaning mass (weaning mass of calf:mass of cow at weaning) ratios

as well as cow efficiencies (205 day mass of calf/cow mass at calving$^{0.75}$) were also calculated.

Statistical analysis was carried out using least-square regression analysis (SAS, 1985). The Bonferroni test (Miller, 1966) was used to test for differences between means. Initial age and mass differed significantly ($P \leq 0.01$) between the two groups. Linear regressions were therefore used to adjust for initial differences in age and mass.

The MN heifers were, on average, 63 days younger ($P \leq 0.001$) than the CN heifers at the beginning of the first mating season (see Table 1). In a study using Friesland, Hereford and Angus-cross heifers, Axelson & Morley (1976) concluded that where heifers were 14 to 16 months of age at the beginning of the mating season, acceptable calving percentages could be achieved during a restricted mating season of 6 weeks, provided the heifers weighed more than 200 kg. However, these researchers are of the opinion that heifers of 12 months of age should be heavier to achieve results similar to those obtained from 14- to 16-month-old heifers. The mass of heifers at the beginning of the mating season is therefore important, particularly in respect of the significant relationship found with conception rate (Meaker, 1975; Topps, 1977). The average difference in mass of the MN and CN heifers at the beginning of the first mating season (12.9 kg), was found to be not significant ($P > 0.05$) (see Table 1).

At calving, the MN and CN heifers were on average 22.0 and 24.8 months of age, respectively, which was a difference ($P \leq 0.01$) of 2.8 months (see Table 1). This clearly shows that CN heifers conceived later than MN heifers.

The mass of a heifer after calving is particularly important because it is used to estimate the birth mass ratio and because of the role which it plays in dystocia cases. After calving, the CN heifers were on average 29.6 kg heavier than the MN heifers ($P \leq 0.01$) (see Table 1). The mass of the MN heifers increased from the first breeding season to just after calving by only 8.6%, while in the case of the CN heifers, the increase amounted to 25.9%. The change in feeding level, from feedlot conditions to natural sweet pasture, thus had a marked effect on the mass of MN heifers.

The conception percentage of MN and CN heifers was 80% and 79.3%, respectively ($P > 0.05$). Heifers with hypoplasia of the ovaries, of which two in each group were detected, decreased the conception percentage. The calving percentage of the MN and CN heifers was 73.3% and 75.9%, respectively ($P > 0.05$) (Table 2). All heifers calved without any problems. Hypoplasia of the gonads should be selected against. One method of doing so, as early as possible in the reproductive life of such heifers, may be early mating. The high reconception rates of both the MN and CN heifer groups (Table 2) indicated that there was no detrimental carry-over effect in either of the early mated groups.

The estimation of calf losses and weaning percentage is important since it reflects reproductive efficiency and affects the amount of meat produced per ha. Calf losses from prebirth up to weaning in the case of the MN and CN heifers were 16.7% and 13.0%, respectively. The restricted number of animals used and the fact that one death constituted a large percentage difference, is a possible reason why the percentage is so high.

The mass changes of the two heifer groups from the first mating season up to weaning of their calves are given in Table 1. It is clear that the change in feeding level, from feedlot conditions to natural sweet pasture, retarded the growth of the MN heifers, which was reflected in a lower body mass. Mass of the young cows at both the beginning and end of the next mating season is important since it is an indication of the expected reconception (Grosskopf, 1976; Meaker *et al.*, 1980). At the beginning, the end and at weaning during the second season, there were no significant ($P > 0.05$) differences between the masses of the two groups (Table 1).

The importance of birth mass cannot be over-emphasized on account of the relationship which exists between birth mass and dystocia. The average birth mass of calves of the MN and CN cows did not differ significantly (Table 1). The birth mass of calves, expressed as a percentage of the mass of the MN

Table 1 Least-squares means (± *SE*) for changes in mass, mass ratios, age and efficiency for two groups of Nguni heifers

Parameters	Group		Significant differences[1]
	MN Nguni	CN Nguni	
[a] Age at first mating season (days)	386 ± 0.7	449 ± 0.5	MN < CN**
Age at calving (days)	669 ± 4.3	753 ± 3.0	MN < CN**
[a] Mass at 1st mating season (kg)	264 ± 4.4	251 ± 3.0	–
Mass after calving (kg)	286 ± 5.0	316 ± 3.5	MN < CN**
Mass at start of 2nd mating season (kg)	330 ± 6.2	344 ± 4.2	–
Mass at end of 2nd mating season (kg)	352 ± 7.2	361 ± 4.9	–
Mass of cows at weaning of calves (kg)	350 ± 7.1	355 ± 4.9	–
Birth mass of calves (kg)	23.6 ± 1.15	24.9 ± 0.84	–
Birth mass ratio (%)	8.3 ± 0.38	7.9 ± 0.23	–
Weaning mass of calves (kg)	164.6 ± 6.84	153.8 ± 4.73	–
Weaning mass ratio (%)	47.1 ± 2.12	43.5 ± 1.36	–
Cow efficiency index	2.4 ± 0.13	2.0 ± 0.14	MN > CN*

[1] * = $P < 0.05$; ** = $P \leq 0.01$; MN = stall-fed group; CN = control group.

[a] Adjusted for differences in mass and age at the beginning of the experiment.

Table 2 Reproductive data of two groups of Nguni heifers

Parameter	Group	
	MN Nguni	CN Nguni
First season		
Number mated	15	29
Number no oestrus	0	2
Number with hypoplasia	2	2
Number conceived	12	23
% Conceived	80.0	79.3
Number of abortions	1	1
Number of calves born	11	22
% Calved	73.3	75.9
Number dead *post partum*	1	2
Number weaned	10	20
% Calves weaned	66.7	69.0
Second season		
Number reconceived	10	18
% Reconceived	83.3	78.3

and CN cows after calving, also did not differ significantly between the two groups (Table 1) and fell within the acceptable norm of 7 to 9% (Heyns, 1974).

Although the MN cows weaned heavier calves than the CN cows, the difference of 11.1 kg was not significant (Table 1). The fact that the weaning mass of calves, expressed as a percentage of the mass of cows after calving, is used as a standard of cow efficiency, makes it an important estimation. The weaning mass ratio of the MN and CN cows also did not differ significantly (Table 1). In contrast to weaning mass ratio, the cow efficiency index of the MN cows was significantly higher ($P \leq 0.01$) than that of the CN cows (Table 1). This may be attributed to both the higher weaning mass of the MN calves (Table 1) and the slightly lighter MN cow mass (Table 1).

This study suggests that, with effective herd and pasture management under extensive sweet pasture conditions, the Nguni possesses the potential to calve successfully before or at the age of 24 months. The variables, viz. initial reproduction, body mass and reconception, were not suppressed by mating Nguni heifers at approximately 15 months of age on veld.

Mortality and weaning percentages compared well with some results in the literature (Dominguez *et al.*, 1991). Since no dystocia cases were experienced, the birth masses recorded are regarded as acceptable when Nguni heifers calve for the first time at the age of two years. This further implies that these heifers were functionally developed.

Early mating of Nguni heifers between the ages of 13 to 15 months may also select for early calving, which will increase fertility. The effect on lifetime production should, however, be further investigated.

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