MARDI Res. J. 22 (1)(1994): 91–95

Reproductive performance of Kedah-Kelantan crossbred cattle

(Prestasi pembiakan lembu kacukan Kedah-Kelantan)

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Key words: Kedah-Kelantan crossbred cattle, age at first calving, calving interval, postpartum reproductive performance

Abstract

Data from a beef cattle crossbreeding project conducted at MARDI Livestock Research Centre, Kluang, Johor, from 1986 to 1990, were used in an analysis for age at first calving, calving interval and calving rate of Kedah-Kelantan (KK) and KK crossbred cows. The ages at first calving were 37.4 ± 1.04, 33.7 ± 1.70, 32.2 ± 1.09 and 37.5 ± 0.85 months for KK, Hereford-KK (HK), Friesian-KK (FK) and Brahman-KK (BK) heifers respectively. Age at first calving was younger (p <0.01) in the HK and FK than KK and BK heifers. The mean calving intervals of KK, HK, FK and BK cows were 12.6 ± 0.10, 11.9 ± 0.11, 12.2 ± 0.14 and 12.4 ± 0.14 months respectively. The calving rates of KK and KK crossbred cows ranged from 92.4% to 97.2%. The KK crossbred cows had higher (p <0.05) calving rate than the straightbred KK cows.

Studies on the postpartum reproductive performance in 80 KK and crossbred cows showed that the mean intervals from calving to first breeding were 73.9 ± 6.06, 51.3 ± 7.61, 48.1 ± 5.98 and 54.4 ± 8.30 days, and from calving to conception were 83.4 ± 6.49, 59.7 ± 8.41, 61.3 ± 5.99 and 61.3 ± 8.4 days for KK, HK, FK and BK cows respectively. KK cows had a longer (p <0.05) calving to conception interval compared with crossbred cows. This study shows that the KK crossbreds are suitable breedtypes for commercial beef production in Malaysia.

Abstrak

Data daripada projek pembiakbakaan di Pusat Penyelidikan Ternakan, MARDI, Kluang Johor dari 1986 hingga 1990 digunakan untuk analisis umur kelahiran anak yang pertama, sela beranak dan kadar kelahiran bagi lembu betina Kedah-Kelantan (KK) dan kacukannya. Umur kelahiran anak yang pertama bagi KK, Hereford-KK (HK), Friesian-KK (FK) dan Brahman-KK (BK) masing-masing 37.4 ± 1.04, 33.7 ± 1.70, 32.2 ± 1.09 and 37.5 ± 0.85 bulan. Kacukan HK dan FK melahirkan anak yang pertama ketika berumur lebih muda (p <0.01) daripada KK dan BK. Purata sela beranak bagi KK, HK, FK dan BK masing-masing 12.6 ± 0.10, 11.9 ± 0.11, 12.2 ± 0.14 dan 12.4 ± 0.14 bulan. Kadar kelahiran bagi KK dan kacukannya ialah 92.4–97.2%. Kacukan KK mempunyai kadar kelahiran yang lebih tinggi (p <0.05) daripada KK.

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Kajian terhadap prestasi pembiakan selepas beranak bagi KK dan kacukannya menunjukkan bahawa purata tempoh dari beranak hingga pengawanan yang pertama ialah 73.9 ± 6.06, 51.3 ± 7.61, 48.1 ± 5.98 dan 54.4 ± 8.30 hari masing-masing bagi KK, HK, FK dan BK. Purata tempoh dari masa beranak hingga konsepsi 83.4 ± 6.49, 59.7 ± 8.41, 61.3 ± 5.9 dan 61 ± 8.40 hari masing-masing bagi KK, HK, FK dan BK. Lembu betina KK (p <0.05) mempunyai tempoh antara beranak hingga konsepsi yang lebih panjang daripada kacukan lain. Kajian ini menunjukkan bahawa kacukan KK sesuai untuk digunakan dalam pengeluaran lembu pedaging secara komersial di Malaysia.

Introduction

Reproductive performance in beef cattle is an important trait influencing the profitability of beef production. Good reproductive performance means early annual production of live calves which are capable of fast growing to a desired marketable weight. However, reproductive performance of beef cattle is affected by both cow management and breedtype. Crossbreeding could improve the female reproductive efficiency. It provides an opportunity to increase production by combining the desirable characteristics of two or more breeds and taking advantage of heterosis. Heterosis effects on reproductive traits such as calving rate and maternal ability have been reported (Cundiff et al. 1974; Peacock and Koger 1980).

Kedah-Kelantan (KK) cattle, which constitute about 91% of the total beef cattle population in Malaysia (Anon. 1989), are reputed to have a high fertility rate (Tan et al. 1985, 1986) and the ability to bear one calf a year (Clayton 1983). This indigenous animal has a small frame size. Crossbreeding work utilising the KK have been aimed at upgrading the growth performance and the size of the animal. The KK cows have been crossed with Hereford and Brahman sires (Flint 1971), Angus and Shorthorn sires (Pathmasingam and Sivarajasingam 1978) and with Polled Hereford, Friesian and Brahman bulls (Dahlan 1985; Ariff et al. 1986). The crossbred F_1 generation had superior growth and carcass compared with straightbred KK (Dahlan 1985). The Hereford-KK and Friesian-KK heifers were 6.5–6.7 months younger than the KK heifers at first calving (Ariff et al. 1986). As a limited body of information is available on the comparative reproductive performance of the KK crossbreds, the objective of this study was therefore to examine breed differences on age at first calving, calving interval and postpartum fertility amongst KK crossbred cows and straightbred KK cows.

Materials and methods

This study was conducted at MARDI Livestock Research Centre, Kluang, Johor. The crossbreeding programme involved the KK cows as the base dam population and selected exotic beef sires of Hereford, Brahman and Friesian breeds. From 1978 to 1983, the KK cows were bred by natural mating with KK and Brahman bulls, and by artificial insemination using Hereford and Friesian frozen semen. At the beginning of the 1978 breeding season, 244 heads of KK cows were available for the crossbreeding project. Four KK bulls and five Brahman bulls were used annually with each bull being mated to 25 or 30 KK cows. Since 1982, the F_1 progenies of Brahman-KK (BK), Hereford-KK (HK) and Friesian-KK (FK) crosses were inter-se mated. A total of 5 BK, 4 HK and 4 FK crossbred bulls were used in the inter-se mating. Two 90-day mating seasons were practised per year. Cows that were diagnosed not pregnant after two mating seasons were culled.

The cows were grazed on improved pasture of *Bracharia decumbens* and *Setaria kazungula* at a stocking rate of 4–5 animals

per hectare. The pastures were fertilized with 180 kg nitrogen, 80 kg phosphorus and 80 kg potassium annually in two applications. Palm kernel cake (gross energy 17.3 MJ/kg; crude protein 16%), used as a concentrate feed supplement, was provided at approximately 1 kg/head daily for one month prior to breeding.

Age at first calving, calving interval and calving rate

The particulars of calf born were recorded on the cow individual record card. These included birth date, birth weight, sex and the identification of the calf. The reproductive problems of the dam such as dystocia, abortion, retained placenta, stillbirth and metritis were also recorded on the card.

A total of 1 542 calvings from 110 KK, 80 BK, 50 HK and 46 FK cows were used for the analysis of age at first calving, calving interval and calving rate. Data on cows with the history of poor body condition, abortion, stillbirth, metritis and retained placenta were excluded from the analysis.

Postpartum reproductive performance

A total of 80 suckled KK, HK, BK and FK cows with a body condition score of 5 or more (1 emanciated, 10 obese) at calving were used to study postpartum reproductive performance. Blood samples were collected via venipuncture of jugular vein twice weekly from the day of calving until 120 days postpartum to monitor the plasma progesterone profiles of each postpartum cow. The samples were chilled immediately in ice, centrifuged and the plasma stored at -20 °C until analysed for progesterone.

Rectal palpation was performed weekly beginning from day 7 after calving until the cows were mated or 120 days postpartum. Changes in the ovarian structures were monitored and recorded. Entire bulls with chin-ball markers were joined to the cows from 20 to 110 days postpartum. A cow that stood to be mounted or marked by the bull was regarded to be in estrus and mated. Pregnancy diagnosis per rectum was done 40–60 days after breeding.

Progesterone assay

The plasma progesterone concentration was determined by solid-phase radioimmunoassay (RIA). The assay was performed using the Coat-a-CountR Progesterone kit (Diagnostic Products Corporation, Los Angeles, USA). The progesterone concentration in the plasma sample was calculated using a logit-log programme on a computer.

A total of 27 assays were done. For each assay, three samples with low, intermediate and high level of progesterone provided in the kit, were included for quality control. The inter-assay variations of the low, intermediate and high level progesterone samples were 16.0, 12.09 and 8.3% respectively. The intra-assay variation was calculated by replicate measurements of the high level progesterone sample in one assay. The intra-assay variation was 5.7%.

Statistical analysis

The rectal palpation and breeding records as well as the plasma progesterone profiles were chronologically compiled for each postpartum cow. Based on these records, the intervals from calving to first breeding and conception were estimated. The analysis of variance was performed to examine the effect of breedtype on age at first calving, calving interval, calving rate, interval from calving to first breeding and interval from calving to conception. Duncan multiple range test was performed to compare the differences between means among the breedtypes. The data on the percentage return to estrus and the conception rates were analysed by Chi-Square.

Results and discussion

Age at first calving was significantly lower (p <0.01) in HK and FK than in KK and BK heifers *(Table 1)*. Both HK and FK heifers calved 4–5 months earlier than the KK heifers. This result was similar to that

reported earlier (Ariff et al. 1986). The ages at first calving reported by Ariff et al. (1986) were 30.5, 30.7, 35.7 and 37.2 months for the HK, FK, BK and KK heifers respectively.

The mean calving intervals for the KK and KK crossbred cows ranged from 11.9 to 12.6 months *(Table 1)*. About 50% of the calving intervals were below 12 months with some of the crossbred cows having calving intervals of less than 10.5 months. The crossbred cows had a shorter calving interval than the KK cows. The differences in mean calving intervals between breedtypes, however, were not significant. This finding was similar to that reviewed by Galina and Arthur (1989) in that there was no significant difference in the calving interval between the different breeds of cow in the tropic. However, the calving intervals obtained in this study were shorter than those reported for *Bos taurus* or *Bos indicus* crossbred cows in the tropic (Galina and Arthur 1989). The short calving interval in the KK crossbred cows could be due to good nutrition as the animals were grazed on improved pasture and given concentrate supplement before the breeding season. A calving interval of less than 10.5 months had been reported in a commercial herd of KK cattle grazing improved pasture in Malaysia (Clayton 1983).

The calving rates of KK crossbreds were higher ($p < 0.05$) than the straightbred KK cows *(Table 1)*. The high calving rate could be attributed to good nutrition and the effects of heterosis in the crossbreds.

The mean interval from calving to first breeding was shorter ($p < 0.05$) in the KK crossbred than in KK cows *(Table 2)*. Some of the KK crossbred cows were mated as early as 30 days postpartum. The first service conception rate was 50.0% in KK, 73.3% in HK, 55.6% in FK and 86.7% in BK cows. The conception rate was higher ($p < 0.05$) in HK and BK cows than in KK and FK cows. The mean interval from calving to conception was shorter ($p < 0.05$) in KK crossbred cows than in straightbred KK cows. The mean calving to conception interval or the days open for all breedtypes, however, did not exceed 85 days. Peters (1984) stated that the interval from calving to conception should not exceed 80–85 days if a calving interval of 12 months is to be achieved. The mean calving intervals of the population of crossbred cows in this study

Table 1. Reproductive performance of KK and KK-crossbred cows

Breedtype	n	Age at first calving (months)	n	Calving interval (months)	Calving rate (%)
Kedah-Kelantan (KK)	28	37.4 ± 1.04a	260	12.6 ± 0.10	92.4c
Hereford-KK	23	33.7 ± 1.70b	133	11.9 ± 0.11	97.2d
Friesian-KK	30	32.3 ± 1.09b	129	12.2 ± 0.14	95.3d
Brahman-KK	29	37.5 ± 0.85a	189	12.4 ± 0.14	95.4d

ab Mean values with different letters within the column differ significantly ($p < 0.01$)
cd Mean values with different letters within the column differ significantly ($p < 0.05$)

Table 2. Postpartum reproductive performance of KK and KK crossbred cows

Breedtype	n	Calving to first breeding (days)	Calving to conception (days)	First service conception rate (%)
Kedah-Kelantan (KK)	19	73.9 ± 6.06a	83.4 ± 6.49a	50.0a
Hereford-KK	18	51.3 ± 7.61b	59.7 ± 8.41b	73.3b
Friesian-KK	19	48.1 ± 5.98b	61.3 ± 5.99b	55.6a
Brahman-KK	18	54.4 ± 8.30b	61.3 ± 8.40b	86.7b

Mean values with different letters within each column differ significantly ($p < 0.05$)

exceeded 12 months except for the HK crossbreds.

The crossing of the KK cattle with Hereford, Friesian and Brahman sires produced heterosis which not only increased the growth performance and improved the carcass quality of the F_1 crossbred calves (Dahlan 1985) but also improved the reproductive performance of the crossbred dams. The HK, FK and BK dams had superior postpartum reproductive performance than the straightbred KK cows. Heterosis effects on the postpartum reproductive performance were high in the HK crosses than in the FK and BK crosses.

The KK crossbreds could be the potential cattle breedtypes for commercial beef production in Malaysia. The reproductive performance of these crossbreds was better than the straightbred KK cattle when grazed on improved pasture. However, little is known on the reproductive performance of these crossbreds when reared and grazed on native pasture under plantation crops or smallholders' environment. Further studies, therefore, should be carried out to evaluate the reproductive performance of these KK crossbred cows under such environments.

Acknowledgements

The authors wish to express their gratitude to Mr Daud Endam, Mr Rusli Abdul Hamid, Mr Hailan Hassan Tami and Mr Mashodi Surip for their involvement in implementing the research project and collecting the data. Sincere thanks are also due to Mr Ahmad Shokri Hj. Othman and Mr Chiew Key Szu for the statistical analysis, to Ms Zainab Nasri for her assistance in the plasma progesterone radioimmunoassay and to Ms Zaleha Mahmud for her help in typing the article.

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Accepted for publication on 11 May 1994