UNIVERSITI PUTRA MALAYSIA

POSTPARTUM REPRODUCTIVE PERFORMANCE OF KEDAH·KELANTAN CATTLE AND ITS CROSSBREDS

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FPV 1993 3

POSTPARTUM REPRODUCTIVE PERFORMANCE OF KEDAH-KELANTAN CATTLE AND ITS CROSSBREDS

By

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Thesis submitted in Fulfilment of the Requirements for the Degree of Master of Science in the Faculty of Veterinary Medicine and Animal Science, Universiti Pertanian Malaysia

February 1993

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ACKNOWLEDGEMENTS

I wish to express my gratitude to my supervisors, Dr. Tan Hock Seng, Dr. Adnan Sulong and Dr. Mohd. Ariff Omar for their continuous guidance, support and encouragement, not only in the preparation of this thesis but also throughout the duration of my graduate studies.

Special thanks are extended to Encik Ahmad Shokri Hj. Othman and Encik Chiew Key Szu for their consultation in the statistical analysis of the data and to Mrs. Zainab bte Nasri for her assistance in the plasma progesterone radioimmunoassay.

Further acknowledgements are also due to Encik Daud Endam, Encik Rusli Abdul Hamid, Encik Hailan Hassan Tani, Encik Hamdan Minhat and Encik Mashodi Surip for their involvement directly or indirectly in implementing the research and collection of data in the beef cattle crossbreeding programme in MARDI Livestock Research Centre, near Kluang. Sincere thanks are also due to Mrs. Samiyah Mohd. Nasir for her assistance in translating the abstract and editing the manuscript, Mrs. Kunaeswary Thambirajah for her help in typing the manuscript and Dr. Mohd. Khusahry Mohd. Yusof for his assistance in the final preparation of this thesis.

I am grateful to Encik Ahmad Tajuddin Zainuddin, Director of Livestock Research in MARDI who had given me the permission and encouragement in conducting this research. I am also grateful to the Malaysian Agricultural Research and Development Institute (MARDI) for funding the research.

This manuscript and the work it represents could not have been achieved without the patience and understanding of my wife, Seriyati Badaruddin, my two sons, Jafni and Jazri, and my daughter, Jauhanis.

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For the Degree of Master of Science

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February 1993

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The calving interval of 286 Kedah-Kelantan (KK) cattle and KK crossbreds were obtained from the individual cow breeding records from a crossbreeding project between 1988 to 1990 at Livestock Research Centre MARDI, Kluang, Johore. Postpartum ovarian activity and fertility in 80 suckled cows were studied using clinical observation and progesterone radioimmunoassay. The effect of restricted suckling period on the subsequent reproductive performance of the cows and the growth of their calves were investigated using 46 Kedah-Kelantan and KK cross bred cows.

The objectives of these studies were to compare the calving interval and the postpartum ovarian activity and fertility of KK crosses to that of straightbred KK and to evaluate the effect of restricted suckling period on the subsequent reproductive performance of the cows as well as their calves growth performance.

The present results showed that the KK and KK crossbred cows had satisfactory reproductive performance. The mean calving intervals of KK, Brahman-KK (BK), Hereford-KK (HK) and Friesian-KK (FK) were 12.6±0.1, 12.4±0.14, 11.9±0.11 and 12.3±0.14 months, respectively. The first calving interval tended to be the longest, while the fourth, fifth and sixth calving interval tended to be the shortest.

Studies on the postpartum ovarian activity and fertility showed that the KK cattle and KK crosses resumed early postpartum ovarian activity. By 60 days postpartum, 52.6%, 66.7%, 88.3% and 73.7% of KK, BK, HK and FK cows resumed postpartum ovarian activity. The mean interval from calving to first ovulation was 66.3±6.72, 54.3±8.42, 49.0±7.46 and 48.1±5.98 days, for KK, BK, HK and FK, respectively. The mean interval from calving to conception was 83.4±6.94, 61.3±8.40, 59.7±8.40 and 61.3±5.99 days, respectively. KK cows had significantly ($P<0.05$) longer interval

between calving to conception compared with the crossbred cows. Restricting the suckling period to once daily for 30 to 45 minutes significantly reduced the interval from calving to first ovulation, calving to conception, but did not influenced the weaning weight of their calves. The interval from calving to first ovulation was reduced significantly ($P<0.05$) from 58 days to 37 days in once daily suckled cows. The calving to conception interval was significantly ($P<0.05$) shorter in once daily suckled cows (64.2 days) compared to normal suckled cows (83.8 days). The pregnancy rate was significantly ($P<0.05$) higher in once daily suckled cow (100%) than in normal suckled cows (79.2%). The average daily gain of the calves from birth to weaning at 6 months old was 353.5 gm/day in normal suckling and 333.50 gm/day in once daily suckling calves. This study showed that the KK crossbreds are suitable breedtypes to utilize for beef production in Malaysia, based on their high reproductive efficiency.

Abstrak tesis yang dikemukakan kepada
Senat Universiti Pertanian Malaysia
sebagai memenuhi dari keperluan untuk
Ijazah Master Sains

PRESTASI PEMBIAKAN SELEPAS BERANAK BAGI LEMBU KEDAH-KELANTAN DAN KACUKANNYA

OLEH

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Februari 1993

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Sela beranak bagi 286 ekor lembu betina Kedah-Kelantan (KK) dan kacukannya telah diperoleh daripada rekod pembiakan individu dalam projek pembiakan kacukan di Pusat Penyelidikan Ternakan, MARDI, Kluang, Johor. Keaktifan ovari selepas beranak dan kesuburan 80 ekor lembu yang bersusu telah dikaji secara pencerapan klinikal dan radioimunoassai progestron. Kesan menghadkan tempoh menyusu terhadap prestasi pembiakan lembu betina seterusnya dan pertumbuhan anak yang dilahirkan telah diselidik dengan menggunakan 46 ekor KK dan kacukannya.

Objektif kajian ini ialah membandingkan sela beranak dan keaktifan serta kesuburan ovari selepas beranak bagi kacukan KK

berbanding dengan baka tulen KK, dan menilaikan kesan tempoh menyusu yang terhad terhadap prestasi pembiakan lembu betina seterusnya dan pertumbuhan anaknya.

Keputusan yang diperolehi menunjukkan bahawa lembu betina KK dan kacukannya mempunyai prestasi pembiakan yang memuaskan. Purata sela beranak bagi KK, Brahman-KK (BK), Hereford-KK (HK) dan Friesien-KK (FK) masing-masingnya adalah 12.6±0.10, 12.4±0.14, 11.9±0.11 and 12.3±0.14 bulan. Sela beranak pertama merupakan yang terpanjang, manakala sela beranak keempat, kelima dan keenam merupakan yang terpendek.

Kajian terhadap keaktifan dan kesuburan ovari selepas beranak menunjukkan bahawa ovari lembu KK dan kacukannya cepat menjadi aktif semula selepas beranak . Dalam tempoh 60 hari selepas beranak, peratus lembu betina yang mempunyai ovari yang aktif adalah 52.6%, 66.7%, 88.3% dan 73.7% masing-masingnya bagi KK, BK, HK dan FK. Purata tempoh dari lepas beranak hingga ovulasi pertama selepas beranak adalah 66.3±6.72, 54.3±8.42, 49.0±7.46 dan 48.1±5.98 hari masing-masingnya bagi KK, BK, HK dan FK. Purata tempoh dari beranak hingga konsepsi adalah 83.4±6.94, 61.3±8.40, 59.7±8.40 dan 61.3±5.99 hari masing-masingnya bagi KK, BK, HK dan FK. Lembu-lembu betina KK nyata

(P<0.05) mempunyai tempoh yang lebih lama di antara beranak hingga konsepsi berbanding dengan kacukan yang lain.

Menghadkan tempoh menyusu kepada sekali sehari selama 30 hingga 40 minit, dapat memendekkan tempoh dari beranak hingga ovulasi pertama, dan dari beranak hingga konsepsi, tetapi tidak menjejaskan berat sapih anaknya. Tempoh dari beranak hingga ovulasi pertama nyata dapat dipendekkan (P<0.05) dari 58 hari kepada 37 hari pada lembu yang menyusukan anak sekali sehari. Bagi lembu yang menyusukan anak sekali sehari berbanding dengan lembu yang menyusukan anak secara biasa, tempoh dari beranak hingga konsepsi (64.2 hari mln. 83.8 hari) adalah nyata lebih pendek (P<0.05). Kadar kebuntingan nyata lebih tinggi (P<0.05) pada lembu yang menyusukan anak sekali sehari (100%) berbanding dengan lembu yang menyusukan anak secara biasa (79.2%). Pertambahan berat badan harian dari lahir hingga disapih pada umur 6 bulan adalah 353.5 dan 333.50 gm/hari bagi penyusuan biasa dan menyusu sekali sehari. Kajian ini menunjukkan bahawa kacukan KK adalah sesuai untuk digunakan dalam produksi lembu pedaging di Malaysia berasaskan kecekapan pembiakan yang tinggi.

CHAPTER I

INTRODUCTION

The Kedah-Kelantan (KK) cattle with an estimated population of 467,680 heads constitutes about 91% of the total beef cattle population in Malaysia (Department of Veterinary Services, 1989). This indigenous cattle is a stabilised crossbred of mixed Shorthorn type x Zebu ancestry (Devendra *et al.*, 1973). The KK cattle is considered a small sized breed ranging in mature weight from 300 to 312 kg in male and from 229 to 240 kg in female (Devendra and Lee, 1975). They are extremely hardy, well adapted to the tropical enviroment and are tolerant to ticks and internal parasites. More than 90% of these KK cattle are owned by smallholder farmers who produce about 90% of the total amount of beef produced in the country. These smallholders reared their cattle as a supplementary activity and they normally keep an average herd seldom exceeding 10 animals per herd. Most of the beef cattle owners manage their animals by allowing them to graze on land overgrown with native vegetation. Little, if any, feed supplementation is given to the cattle during critical period of their reproductive phases or during periods of feed shortages. Because of this lack of proper feeding management

and genetic improvement, the productivity of the KK cattle is low in spite of its high fertility and ability to bear a calf a year.

Malaysia imported various breeds of exotic beef cattle for the purpose of increasing the population and improving the productivity of the local beef cattle. Among the imported beef breeds were the American Brahman, Hereford, Aberdeen Angus, Droughtmaster and Santa Gertrudis. These exotic breeds were maintained pure or interbred with the KK cattle. The main beef breeds which are still present in this country are the Droughtmaster and the Brahman. Limited data published on the performance of these imported cattle showed a considerably higher growth rate among the exotic cattle but a relatively poor reproductive performance (Jalaluddin *et al.*, 1983). Poor nutrition and management adversely affect the reproductive performance of these animals. Jalaluddin *et al.* (1983) reported that with an improved management, the mean calving interval of a herd Droughtmaster grazed on improved pasture was reduced from 460 days to 350 days. The calving intervals of Droughtmaster cattle reared by the smallholders ranged from 503 to 573 days (Mohd. Yusof *et al.*, 1981).

Reproduction is the main factor limiting the production efficiency of beef cattle (Dziuk and Bellows, 1983; Koch and Algeo, 1983). For optimum reproductive performance, the beef cow must raise a live calf during each year of her productive life and has a calving interval of 12 months. The calving interval is largely determined by postpartum anestrous or the interval from parturition to first estrus. Prolonged postpartum to first estrus interval is a major cause of long calving interval in beef cattle in the

tropics. Postpartum anestrous is a common reproductive problem reported in cattle in Malaysia (Tan, 1983) and is the main cause of poor reproductive performance of imported beef cattle (Tan and Jalaluddin, 1983).

Significant improvement in female reproductive efficiency in beef cattle can be obtained through crossbreeding. Crossbreeding 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).

The Kedah-Kelantan cattle, being the most prominent and the largest breeding group of cattle in this country, serves as a base population for crossbreeding with exotic sire breeds. The KK cows were crossed with Hereford and Brahman sires (Flint, 1971), Angus and Shorthorn sires (Pathmasingam and Sivarajasingam, 1978) and with Polled Hereford, Friesian and American Brahman bull (Dahlan, 1985; Ariff *et al.*, 1986). Baharin (1978), summarising the result of trials conducted at UPM, MARDI, Veterinary Institute and commercial farms indicated encouraging performance of the crossbreeds. The Hereford-KK crosses were superior than the Brahman-KK crosses in terms of growth rate and reproductive performance. Similarly, the Angus-KK crossbreds were superior than the Shorthorn-KK crossbreds (Pathmasingam and Sivarajasingam, 1978). Comparing the performance of the crossbreds with straightbred KK, Dahlan (1985) reported that the growth performance and carcass characteristics of F_1 KK crossbreds were superior than the straightbred KK. The KK

crossbred calves were 29 to 32% and 23 to 59% heavier at birth and at 12 months respectively as compared to straightbred KK.

Information published on the comparative reproductive performance of KK and KK crossbreds is limited. Baharin (1978), in comparing the F1 crossbred females found that the HK heifers required lesser number of services per conception (1.8 vs 3.0) and had higher conception rate (50% vs 33%) than the Brahman-KK females. Ariff *et al.* (1986) reported that the HK and FK heifers were 6.5 to 6.7 months younger than KK heifers at first calving. The age at first calving was 30.5, 30.7, 35.7 and 37.2 months for HK, FK, BK and KK, respectively. The calving rate of HK, FK, BK and KK was 87%, 90%, 87% and 91%, respectively.

The objectives of the present study were to assess and compare the calving intervals of KK and KK crossbred cows from records and to evaluate and compare the postpartum ovarian activity and fertility of these animals using clinical observation and plasma progesterone radioimmunoassay. In a search for an efficient beef cattle management system, a study was also designed to investigate the effect of restricted suckling period on the postpartum reproductive performance of the dam as well as on the growth performance of the calf.

CHAPTER II

LITERATURE REVIEW

Reproductive Efficiency of Beef Cattle

The local beef cattle population stands at about 514,015 heads with almost 91% of these animals made up of the Kedah-Kelantan cattle and 9% of exotic and various crossbreds (Department of Veterinary Services, 1989). The reproductive efficiency of these cattle is most commonly assessed and reported in terms of age at first calving, calving interval, calving rate and pregnancy rate. Tremendous variation exists in reproductive performance of not only the exotic purebreds but also the indigenous KK and crossbred cattle. The wide range in value of the parameters reported shows that reproductive efficiency of beef cattle is influenced by environment, management, nutrition and the genetic capacity of a particular breed.

Kedah-Kelantan (KK) Cattle

The KK cattle, being an indigenous breed, is well adapted to the local environment. This cattle is considered a small size breed. The mean birthweight and weaning weight at 7 months of KK calves is 16 and 88 kg, respectively (Ahmad and Kamal, 1984). The average growth rate of KK calves was 0.36 kg per day (Clayton, 1983) and the

mature body weight of male and female cattle ranged from 300 to 312 kg and from 229 to 240 kg respectively (Devendra and Lee, 1975,). The main disadvantage of KK cattle is its slow growth rate.

The indigenous KK cattle is, however, reputed to have high fertility, with a high conception rate to natural mating (Tan *et al.*, 1985, 1986). A conception rate of 87.5% was obtained when suckled KK cows were mated at or less than 30 days postpartum and a 100% conception rate was obtained when they were mated at 30 to 90 days postpartum. The pregnancy rate recorded for KK cattle ranged from 72 to 100% (Ahmad and Kamal, 1984; Tan *et al.*, 1985) while the calving rate ranged from 85% to 120% (Clayton, 1983; Bauer, 1984; Ariff *et al.*, 1986). The age at first calving ranged from 26 to 54 months (Devendra and Lee, 1978) and the calving interval ranged from 341 to 448 days (Devendra and Lee, 1978; Cameons, 1980; Wolf *et al.*, 1982). A calving interval as low as 10½ months had also been reported in a commercial KK herd (Clayton, 1983). Under proper and adequate nutrition, a KK heifer can achieve her first estrus at about 10-12 months of age (Devendra and Lee, 1975). The wide range in values of calving interval, age at first calving, pregnancy rate and calving rate reported could be due to the influence of different herd environment, particularly management.

Imported Exotic Beef Cattle

Various breeds of exotic beef cattle were imported from the United States, Australia and New Zealand for the purpose of increasing the cattle population and the productivity of the local beef cattle. Limited data

published on the performance of these exotic beef cattle showed considerably higher growth rates but relatively poor reproductive performance and low survival rates. The growth perfomance of these exotic cattle was generally better than KK cattle. The mean birthweight of Brahman, Droughtmaster and Santa Gertrudis calves was 26, 35 and 24 kg respectively, and were significantly higher than KK calves, which was only 14 to 16 kg (Jalaluddin *et al.*, 1983). In another study with imported Brahman cattle, Ariff (1978) reported that the mean birthweight and preweaning gain of Brahman calves were 25.5 and 0.45 kg respectively.

The reproductive efficiency of the imported beef cattle was generally poor. The age at first calving for Brahman, Santa Gertrudis and Droughtmaster was 33, 47 and 30 months respectively (Jalaluddin *et al.*, 1983). Although the average age at first calving of the exotic breeds was lower compared to indigenous cattle, which tends to exceed 40 months, the calving interval of the former was much longer than the latter. The calving intervals ranged from 428 to 537 days for Brahman cattle (Pathmasingam 1975; Jalaluddin *et al.* 1983), 396 to 560 days for the Hereford (Murugaiyah *et al.*, 1983), 210 to 540 days for the Santa Gertrudis (Baharin and Mak, 1975) and 345 to 460 days for the Droughtmaster (Jalaluddin *et al.*, 1983). The long calving interval was due to the relatively longer postpartum anestrous, which is a major cause of poor reproductive performance in imported cattle in Malaysia (Tan and Jalaluddin, 1983).

Most data on reproductive efficiency of imported beef cattle were obtained from institutional farms. There is still a lack of information on the

reproductive performance of imported beef cattle reared under smallholders' condition, Mohd. Yusof *et al.* (1981) reported a poor reproductive performance of Droughtmaster reared by smallholders in a survey done at Pontian District, Johor. The calving percentage was 71.1% in the first year after importation when most of the animals were impregnated in Australia before importation. Of those cows that had calved down in the first year, only 13.7% calved the second time with a calving interval ranging from 503 to 573 days. In another study, Tan and Jalaluddin (1983) reported low pregnancy rates (25%) among imported Droughtmaster cows under smallholders' condition, with 35% of non-pregnant cows having inactive ovaries associated with postpartum anestrous.

Crossbred Beef Cattle

Recently crossbreeding of beef cattle to improve production efficiency has become widespread. Crossbreeding provides an opportunity to increase production by combining the desirable characteristics of two or more breeds and taking advantage of heterosis. Production traits that have shown the most gain through heterosis are those with low heritibility such as calving rate, calf survival rate, weaning rate and maternal ability. Heterosis effects on calf crop weaned for the Brahman-British crossbred dam was 12.1 to 18.8% (Cundiff, 1970) and for calf survival rate for F_1 Angus Brahman was 14% (Reynolds *et al.*, 1980). The heterosis for cow performance was high for F_1 dams of Zebu-European crosses but low for crosses among European breeds. Peacock and Koger (1980) estimated that the maternal heterosis effects for calving rate were 8.7, 9.2 and 2.2% and for weaning rate were

12.2, 6.9, and 3.3% for Angus-Brahman, Brahman-Charolais and Angus-Charolais dams, respectively. The calving rate for the Angus-Brahman and Brahman-Charolais dams which was 92% and 90%, respectively, was significantly higher than the calving rate of Angus-Charolais dams (82%). The weaning rate for F1 crossbred dams of Angus-Brahman and Brahman-Charolais was also significantly higher than the Angus-Charolais or the purebred dams.

The first crossbreeding work for beef production in this country carried out at UPM, was reported by Flint (1971) and Baharin (1978). The breeding program involved the crossing of the KK cows with Hereford and Brahman sires. The Hereford-KK (HK) crossbred calves were slightly heavier at birth than the Brahman-KK (BK) crossbred but had similiar preweaning gain. The reproductive efficiency of the HK crossbred females was superior than the BK crossbred (Baharin, 1978). The HK heifers required lesser number of services per conception (1.8 vs 3.0) and had a significantly higher conception rate (50% vs 33%) than the BK heifer.

At the Livestock Research Centre, MARDI, Kluang, Johor, crossbreeding of beef cattle was initiated in 1978. KK cows were crossed with Friesian, Hereford and Brahman sires. The crossbred performance was compared with straightbred KK. The crossbred F1 generation showed superior growth performance and carcass characteristics over straightbred KK (Dahlan, 1985). The mean birthweight of the crossbred calves were 29.7% to 31.7% heavier than the KK calves. The average birth weight of KK calves was only 15.4 kg while that of crossbred calves ranged from 20