The 3rd ISTAP, Faculty of Animal Science, Gadjah Mada University, 2002 *ISBN : 979 – 97243 – 2 - 5*

PRODUCTIVE PERFORMANCE OF CALVES FROM LOCAL COWS THROUGH CROSSBREEDING

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Abstract

Data from 185 cows out of purebred Kedah-Kelantan (KK) or crossbred Charolais (CH), Simmental (Sm) and Limousin (Lm) bulls were analysed to evaluate the differences between straight bred and crossbred cattle for productive performances. Purebred KK cows were bred naturally to KK bull and by artificial insemination with semen from Ch, Sm and Lm bulls to produce the first generation calves. The birth weights (bwt), weaning weights (wwt) and yearling weights (ywt) of purebred KK were significantly ($P<0.05$) lower than that from crossbred calves. The CK calves had the heaviest ADG while the KK calves had the lowest (820.0 g/d vs. 531.0 g/d). In the second generation the KK calves had the lightest bwt, wwt and final weight (18.98, 84.98 and 216.38 kg, respectively) while among the crossbreds, though they were not significantly different, SK calves had the heaviest bwt and wwt (23.16 and 95.41 kg, respectively), with the CK calves having the heaviest final weight (fwt) of 271.36 kg.

Key words: Kedah-Kelantan, Crossbred, Reproductive performance

Introduction

Cattle of Bos Indicus origin have a great importance to animal production in tropical environments. Heat tolerance and ability to survive under limited feed resources partly explain the numerous populations of these cattle in countries located in the warm climatic zone (between latitudes 30° north and 30° south) (Mc Dowell *et al.*, 1996). Many attempts to increase performance have been through improved nutrition. An alternative means of increasing returns may be by improving the genotypes of the cattle.

Animal breeders recognize and accept crossbreeding as a method of improving beef cattle production. Crossbred females have been highly productive, but of greater importance is the reproductive efficiency associated with crossbreeding. Reproductive efficiency is partly affected by age at first calving, which is frequently late in the tropics. Reproductive success is essential to the economic efficiency in

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cattle production (Lobo, 1998). Earlier works have shown that in the tropics Bos Indicus crossbred cattle have higher growth rates and lower weight loss during drought than British cattle breeds (Barlow and O'Neill, 1978).

Crossbreeding has been widely attempted throughout the tropics with varying outcomes (Syrsted, 1989, 1990). Tawah *et al.* (1999) working with dairy cattle realized that motivation for popularising crossbreeding with improved Bos Taurus breeds for enhanced milk production in the tropics stems from the consensus that indigenous tropical cattle breeds are poor milkers, European type breeds are not adapted to most tropical conditions of production, and dual-purpose (dairy-beef) production systems need to be promoted, especially in smallholder farming operations where farmers usually have multiple objectives (meat, milk, traction, etc.).

The crossbreeding between Bos Taurus and Bos Indicus has allowed the utilization of heterosis for production characters (Paschal *et al.*, 1995) and crossbred calves generally indicated positive heterosis effects for pre weaning traits (Kress *et al.*, 1995; Long, 1980), especially birth weight (Davis *et al.*, 1998), and post weaning (Paschal *et al.*, 1995), with an estimated weaning weight heterosis of about 10% (Ageeb, 1991). Generally, the F_1 crosses had been the best performers among crossbreds in the warm climatic zones, but the best direction to produce subsequent generations has not been determined (McDowell *et al.*, 1996). Crossbreeding work involving European sire breeds on local Kedah-Kelantan (KK) dams had been carried out by Ahmad *et al.* (1996), where the growth performance improved by 50 to 80%.

The objective of this study was to examine the performance of the crossbred calves out of purebred KK cows mated to Charolais-KK (CK), Limousin-KK (LK), Simmental-KK (SK) crossbred, or straight KK bulls. The growth, adaptation and reproductive performances of these crossbreds in terms of increasing the production in the country, will be analysed.

Materials and Methods

The availability of the crossbred F1 bulls, namely Charolais x Kedah-Kelantan (CK), Limousine x Kedah Kelantan (LK), Simmental x Kedah-kelantan (SK), and purebred Kedah-Kelantan (KK) was made possible through the original matings undertaken at the Malaysian Agriculture Research Development Institute (MARDI) Livestock Research Centre (Ahmad *et al.*, 1993). The mating of the Kedah-Kelantan cows, indigenous Malaysian cattle, with the temperate breeds was done through artificial insemination. The yearling calves, with an average age of ten months, were put on a feeding diet consisting of 50% palm kernel cake (PKC), 40% palm oil sludge (POS), 8% soybean meal (SBM), 1% vitamin, and 1% mineral.

Three full-grown crossbred bulls and a purebred KK bull were used on purebred KK dams to produce the crossbred calves in the second generation. The animals were put on improved pastures of either Guinea grass (*Panicum maximum*) or Signal grass (*Brachiaria decumbens*) at the Universiti Putra Malaysia farm, with mineral salt given free choice. The different breed groups were put in different paddocks.

Natural mating and seasonal breeding was practiced with the assignment of bulls to dam groups done at random. The calves were left with their dams until weaning, at six months of age. Calf birth weights, followed by monthly weights of calves, until disposal from the group, at two years, were recorded. After weaning, the calves were separated according to sex. The dams were rebred the following season, after a resting period of two months.

The performance of the second generation calves out of KK cows mated to the KK, CK, LK and SK bulls were recorded and compared between breeds.

Data were analysed using General Linear Model (GLM) procedure of Statistical Analysis System (SAS, 1996).

Results and Discussion

In the first generation the purebred KK calves, out of small-framed parents, had the lightest birth weight of 17.5 kg, while the crossbred CK calves had the heaviest, at 23.6 kg (Table 1). Although the birth weights among the crossbred calves were quite similar, they were significantly ($P<0.05$) heavier than those from the KK calves. The weaning weight and yearling weight for the purebred and crossbred calves followed the same trend as the birth weight, with the KK calves having the lightest weights ($P<0.05$). The F1 crossbred calves showed superior performance compared to the purebred KK calves, with CK calves showing the heaviest weights at all levels measured, as indicated by Ahmad *et al.*, (1993).

Table 1. Mean weights of purebred Kedah-Kelantan and f1 crossbred calves at various ages

Breed	Weight			ADG (g/day)
	Birth	Weaning	Yearling	
KK	17.5^{b}	79.5^{b}	130.1^{b}	531.0^{c}
CK	23.6^{a}	119.4^{a}	202.3^{a}	820.0^{a}
LK	20.9^{a}	104.4^{a}	189.0^{a}	752.8^{b}
SK	22.9^{a}	121.0^{a}	212.0^{a}	777.7^{b}

$^{a, b, c}$ Means with different superscripts are significantly different at $P<0.05$

The crossbred yearling calves, when put on feeding trial, showed that the CK calves had the highest ADG of 820 g/day which was significantly (P<0.05) higher than SK and LK calves, and the lowest was KK calves, with 531.0 g/day (Table 1). This indicated that calves with lighter birth weight tend to have lower weight gain, and crossbreds also have higher weight gains compared to purebred KK calves.

Table 2 shows the least squares means for weights at various ages of calves in the second generation. Calves sired by KK bull had the lightest birth weight (18.98 kg), weaning weight (84.98 kg) and final weight (216.38 kg), taken at the age of 24 months. The SK sired calves had significantly (P<0.01) heavier birth weight (23.16 kg) than the other crossbred calves, with the weaning weight of 95.41 kg and a final weight of 270.15 kg. This indicated that larger body size of crossbred bulls was transmitted to their calves that then carry them through weaning.

Table 2. Mean calf weight at various ages in the second generation

Sire Breed	Birth weight	Weaning weight	Final weight
Kedah Kelantan	18.98^{a}	84.98^{a}	216.38^{a}
Limousin-KK	21.87^{b}	94.41^{b}	267.82^{b}
Charolais-KK	22.30^{b}	93.14^{b}	271.36^{b}
Simmental-KK	23.16^{b}	95.41^{b}	270.15^{b}

$^{a\,b}$Means with different superscripts are significantly different at P<0.05

Sire breed and sex of calf had a highly significant (P<0.01) effect on birth weight and weaning weight, while final weight was significantly (P<0.01) influenced only by sex of calf (Table 3). Although the three crossbreds did not have any significant difference in their weights at the various weight categories, they were consistently significantly heavier than the KK calves. Male calves were heavier than female calves at all ages, male and female calves out of SK bull had the heaviest weights at birth and weaning while KK calves had the lightest weights at all ages. Age of cows significantly influenced (P<0.01) pre-weaning growth of calves. As the cows grow older they produce heavier calves at birth, and also carry them to heavier weights at weaning. Male calves showed an advantage in body weight over female calves throughout their growth period.

Table 3. Mean squares for weights of calf in the second generation

Source	Birth weight		Weaning weight		Final weight	
	df	MS	df	MS	df	MS
Year	3	435.11**	3	2915.73**	1	31.51
Sire breed	3	348.58**	3	1934.10**	3	4140.97
Sex	1	496.09**	1	3868.20**	1	56385.82**
Error	310	23.15	259	447.47	37	1686.45

**P<0.01

For average daily gain in the second generation, all calves performed similarly pre weaning, but for post weaning KK calves had the lowest ADG compared to the other crossbred calves (Ismail, 2000). The overall pre weaning and post weaning ADG was 0.39 kg and 0.32 kg, respectively, with KK sired calves having the smallest and SK sired calves having the largest.

Table 4. Mean squares for age at calving of crossbred cows

Source	df	MS	p>F
Cow breed	3	52398.18	0.70
Sire breed	3	137672.32	0.30
Calf sex	1	668883.61	0.02
Calf birth weight	1	315123.41	0.09
Dam birth weight	1	327595.67	0.09
Error	157	110953.80	

The second generation heifers, when mated to the purebred KK and crossbred bulls, did not show any significant breed effect, either in the cow or in the sire. However, the mean age at first calving was 1084.96 (± 343.97) days. Only calf sex did contribute significantly ($P<0.05$) to the age at first calving (Table 4). The dams with female calves experienced longer age at first calving, with a mean of 1286.09 days, compared to 1034.43 days for those dams carrying male calves. The KK heifers with a mean calf birth weight of 15.56 kg had a mean age at first calving 1091.67 days, although the female calves, with a mean birth weight of 15.88 kg were lighter than the birth weight for male calves (16.84 kg). The SK heifers, having the heaviest bwt of 25.50 kg, had a mean age at first calving of 1065.83 days.

Starting with a mean birth weight of 16.40 kg in the first calving, the overall birth weight of calves increased to a mean of 22.37 kg in the fifth calving. The calving interval instead decreased from 475.84 days after the first calving, to 397.21 days for the fifth calving. The KK calves had the lightest mean birth weight and the longest mean calving interval of 426.32 days, while the SK calves had the heaviest mean birth weight of 23.71 kg and the shortest mean calving interval of 369.23 days.

The above data indicated that in the first generation the CK calves were superior to the other calves, while in the second generation the SK calves were superior. Overall the crossbred calves were superior to the straight bred calves for all production parameters. It was observed that the cows with the shortest calving intervals were constant calves and thus were more productive, as was indicated by MacGregor and Casey (1999).

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