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The Effects of Crossbreeding on the Milk Production Performance of Kurdish Cows

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Abstract: In this study, data of milk and fat production, lactation length (374 records) and calving interval (305 records) in 12 herds of Kurdish cow and their crosses with Brown Swiss and Holstein in Saghez and Dehgolan were collected from 1999-2001. Data was analysed using SAS. The least square mean of milk yield, fat yield, lactation length and calving interval for genetic group (Kurdish cow and their crosses with Brown Swiss and Holstein) were 1446.15±116.28, 1792.09±110.1 and 1988.64±77.77 kg, 40.62±5.74, 50.93±5.46 and 53.78±3.77 kg, 238.22±12.28, 279.31±9.37 and 278.73±5.33 days and 352.88±16.8, 362.84±12.66 and 361.89±7.51 days, respectively. Genetic group, region, herd within region, season of calving with age ($p<0.01$), region with year of calving and genetic group with year of calving interaction ($p<0.05$) on milk production were significant. The fat production was significantly affected by region, herd within region, age ($p<0.01$), genetic group and season of calving ($p<0.05$). The lactation length was significantly affected by genetic group ($p<0.01$). The calving interval was not significantly affected by genetic and environmental effects ($p>0.05$).

Key words: Crossbreeding, Kurdish cow, milk production, reproduction, enviromental effect, calving group

INTRODUCTION

Many countries in Asia are located in the tropical and sub-tropical zones. Most people in tropical Asia are involved in agriculture. Livestock is generally an integral part of mixed farming systems. Beef and dairy production have been economically important sectors of livestock. All countries in tropical Asia are economically classified as developing countries where most beef and dairy production is derived from smallholder farmers. Large-scale commercial production of beef and dairy is generally very limited due to various constraints especially those concerning economic aspects. Many comprehensive reviews of the performances of more common *B. taurus* dairy breeds introduced into the tropics and their offspring resulted from crossbreeding with the local breeds (Chantalakhana, 1998).

Crossbreeding between highly productive and adapted breeds can improve overall performance. However if crossbreeding is indiscriminate and uncontrolled, it may result in reduced productive advantage. In the starting phases of a crossbreeding programme, performance is always improved due to the heterotic superiority of the first cross. Thereafter if the programme is not checked, the productive advantage may be reduced either because of recombination loss that leads to breakdown of the heterotic superiority in subsequent generations or upgrading to high levels of exotic blood without changing the environment. This leads to insufficient adaptation which is manifested in the decline in performance (Cunningham and Syrstad, 1987; Khan, 1994).

Syrstad (1989) reported a linear improvement in almost all performance traits up to the 50% *Bos taurus* inheritance. The cattle indigenous to most tropical countries belong to the species *Bos indicus*. This species is well adapted to tropical environments. It possesses a high degree of heat tolerance is resistant to tick borne and to other diseases occurring in the tropics and has a low maintenance requirement. However, its potential for milk production is low. On the other hand, *Bos taurus* (European type) is the predominantly specialised dairy breed of the temperate countries. These breeds have high milk yield potentials but lack heat tolerance and disease resistance (Rege, 1998). One way of improving indigenous cattle regarding milk production is through crossbreeding with *Bos taurus* dairy breeds.

This has been widely used in order to combine the high milk yield potential of exotic breeds with the adaptability of the local ones. The first crossbred generation (F1) usually from native females mated with exotic males has been a success in most cases. The F1

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crosses can produce up to 3 times more milk and have longer lactation and shorter calving intervals than the local breeds (Kiwuwa *et al*., 1983; Rincon *et al*., 1982). However, back crossing to the European breeds gave rather disappointing results, i.e., milk yield increased only slightly or even declined and fertility deteriorated. This is in addition to the lack of adaptation to tropical conditions (Syrstad, 1989). The objective of this study is thus to examine the milk production performance of these pure and cross animals and the factors that are influencing the dairy performance.

MATERIALS AND METHODS

The data used in this study, came from the crossbreeding program of the Sanandaj Jahad Keshavarzi in the capital of the province of Kurdistan in Iran. Data collected from 1999-2000 on milk and fat production, lactation length and calving interval traits of Kurdish cow and their crosses with Brown Swiss and Holstein were used for the analysis. In all cases, cows were mated naturally and were managed in a loose housing system. The cows were grazed on natural pastures in 12 herds. Milking was by hand twice daily; milk yield was recorded at each milking. Animals on the farm were regularly vaccinated against common infectious diseases. The data were analysed, using the General Linear Model (GLM) of Harvey. The following mathematical model was applied to analyse all traits:

$$y_{ijklmnpo} = \mu + R_i + H_{ij} + S_k + T_l + B_m + G_n + b\,(A_{ijklmno} - \bar{A}) + e_{ijklmno}$$

Where:

- $y_{ijklmnop}$ = Milk and fat production, lactation length and calving interval with ith region
- jth = Herd within jth region, kth season of calving
- lth = Year of calving, mth age
- nth = Genetic group
- b = Regression of milk and fat production from lactation length for all traits
- $\bar{A}$ = Mean of lactation length
- $e_{ijklmnop}$ = Random error effect
- μ = Overall mean
- R_i = The effect due to the ith region number (i = 1 and 2)
- H_j = Te effect due to jth herd (2, 3, … and 13)
- S_k = Te effect due to the kth season of calving (k = 1... 4)
- T_l = The effect due to the lth year of calving (l = 1, 2 and 3)
- B_m = The effect due to the mth age (l = 1, 2 … and 8)
- G_n = The effect due to the nth genetic group (l = 1, 2 and 3)

RESULTS AND DISCUSSION

Least square mean for milk and fat production, lactation length and calving interval traits of Kurdish cow and their crosses with Brown Swiss and Holstein are shown in Table 1. Mean of milk yield was lowest for purebred Kurdi cows and highest for F1 Holstein with Kurdi. In this study, genetic group herd within region, ($p<0.01$) such interaction effects of region x year of calving, year of calving x genetic group ($p<0.05$), season of calving with age on milk production were significant. But the milk production was not significantly affected by year, season and age of calving effects ($p>0.05$). In the present analysis, effects (region, age and herd within region) and season of calving and genetic group were significant for fat production $p<0.01$ and $p<0.05$, respectively. Lactation length was significantly ($p<0.01$) affected by genetic group. However, other factors did not show significant ($p>0.05$). Lactation length within crosses did not show differences. The calving interval was not significantly affected by genetic and environmental effects ($p>0.05$). The mean calving interval for Kurdi breed was 352.88 days which is <361.89 and 362.84 days of calving interval for their crosses with Brown Swiss and Holstein, respectively. Milk yield for F1 crosses of Holstein and Brown Swiss with Kurdish cow 37.51 and >23.92% the total milk yield in Kurdish cow, respectively. These results are comparable with crossbreeding program the province of Isfahan in Iran where crosses of Holstein and Brown Swiss with Golpayegani cow (Rokoei, 2000; Naji, 1996).

Increases in performance for all milk, reproductive and calf traits up to 62.5% *B. taurus* inheritance after which performance began to decline (Madalena *et al*., 1990). In a comprehensive review of 80 reports from Africa, Asia and Latin America, Rege (1998) reported an improvement in milk yield when the proportion of

Table 1: Least Square means (±SE) for milk and fat production, lactation length and calving interval of Kurdish cow and their crosses with Brown Swiss and Holstein

Cl (days)	LL (days)	Total fat (kg)	Total milk (kg)	Cows and their cross
352.88±16.8	238.22±12.28	40.62±5.74	1446.15±116.28	Kurdish cow
362.84±12.66	279.31±9.370	50.93±5.46	1792.09±110.12	Kurdi x B. Swiss
361.89±7.51	278.73±5.330	53.78±3.77	1988.64±77.770	Kurdi x Holstein

exotic blood increased from 0-50% and a constant level between 50 and 100% exotic inheritance. A similar trend was observed for age at first calving. Lactation length increased over the entire range of exotic grades.

Fat production for F1 crosses of Holstein and Brown Swiss with Kurdish cow 23.39 and >25.38% the total fat yield in Kurdish cow. Lactation length increased with exotic breeds (Holstein and Brown Swiss) which this superior was in milk and fat production. Lactation length decreased slightly with increasing lactation number. The first lactation length was the highest compared to the subsequent lactation lengths.

Given the high levels of management in this herd and the fact that milk volume has a higher monetary value than milk fat yield, the use of the Holstein breed is justified because it was superior to the other *B. taurus* breed (Brown Swiss) for lactation milk yield (Table 1). However, when feed resources are scarce, it would be expected that larger breeds would be less able to meet their feed intake capacity than smaller breeds and may then become less efficient. An important question is whether superior biological efficiency translates to superior economic efficiency, a question that is difficult to answer because of the problems of measuring the inputs of a grazing-based production system in particular feed intake. Feed intake is an important expense trait in explaining variation among breeds in measures of economic efficiency (Chantalakhana, 1998).

CONCLUSION

There is need therefore to establish the nutrient requirements and the utilisation efficiencies of breeds of varying body size so that breeding systems can be matched with different production systems in order to optimise production efficiency.

This is important, especially in tropical dairy production systems where the choice of *B. taurus* and *B. indicus* breeds to be used in crossbreeding should match the levels of inputs which vary markedly both within and among tropical countries.

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