

Research Article



Reproductive Performance of Crossbred Cattle under Intensive Management Condition

HAMZO KHAN KUNBHAR^{1*}, ALLAH BACHAYO LASI², AKEEL AHMED MEMON¹

¹Department of Animal Reproduction, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University, Tandojam. ²Department of Livestock, Government of Baluchistan, Pakistan.

Abstract | The study was carried out at Nagori Dairy Farm, Karachi, Pakistan to investigate the reproductive and productive traits of twenty Crossbred (Holstein-Friesian x Red Sindhi cattle 50% blood level) and twenty Red Sindhi cattle under intensive management conditions. A significant (<0.05) difference was found between the groups for age at puberty, age at first calving, calving interval, 1st post-partum estrus. Mean values for these traits were 616.850 ± 23.50, 928.350 ± 31.803, 413.050 ± 10.362, 105.05 ± 9.004 days in Red Sindhi cattle and 451.650 ± 21.660, 796.5 ± 39.771, 372.200 ± 7.486, 45.300 ± 5.671 days in Crossbred cows, respectively. Slightly higher values for gestation length were observed in Red Sindhi (280.200 ± 0.596 days) than Crossbred cattle (277.35 ± 1.155 days). Significantly higher milk yield per lactation was recorded in Crossbred cows (6052.250 ± 275.444 kg) than Red Sindhi cows (3952.2 ± 137.209 kg). No significant (>0.05) difference was found for service period and dry period between groups. Mean values for service period and dry period were 124.15 ± 10.162 and 89.700 ± 0.596 days in Red Sindhi cows and 181.700 ± 59.199 and 86.950 ± 5.504 days in Crossbred cows. Both groups (Red Sindhi cattle and Crossbred cattle) calved normally at 75% and 65%, respectively. Normal expulsion (within 6-8 hrs.) of placenta was 85% in Red Sindhi and 80% in Crossbred cattle. In conclusion, reproductive and productive performance of Crossbred cattle was significantly superior to the local cattle breed in the study area.

Keywords | Reproduction, Performance, Crossbred cattle, Intensive management

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***Correspondence** | Hamzo Khan Kunbhar, Sindh Agriculture University, Tandojam, Pakistan; **Email:** drkunbhar@gmail.com

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INTRODUCTION

Pakistan is in dire need of livestock production mainly dairy animals to meet the needs of milk and other dairy products for faster growth rate of human population (GOP, 2013-14; Khan, 2002). The animals are also playing major role in running of leather industries through use of their skins and hides. The farmyard manure is still considered as best fertilizer (Khan et al., 2013; Memon, 1994). Limited feed resources demanding efficient utilization of animal wealth in Pakistan. The profitability of dairy animals is directly related to the rate of production, which depends upon reproductive and productive performance of both male and female animals (Ali et al., 2014).

The reproductive and productive performance of indigenous cattle breed is relatively lower, due to un-exploited genotype and poor nutrition (Ali et al., 2014; Kumar et al., 2014; Boby et al., 2013; Haque et al., 2011). The indigenous breeds of cattle have strong disease resistance and are able to thrive best in extreme climatic conditions, whereas exotic breeds have problems of less tick resistance and susceptible to various contagious diseases (Islam and Bhuiyan, 1997). Despite the good genetic potential, productive and reproductive performance of our local breed cows is remained very low. Shortage of feed, lack of access to land, disease prevalence, low level of management, lack of proper breeding and management, poor heat detection and timely breeding might be contributed considerably to long days open (postpartum anestrus), late age at first calving, long calving interval, short lactation length and low milk production (Belay et al., 2012).

The reproductive and productive performance of indige-

The cattle population of Pakistan includes a large number of non-descriptive animals with low inheritance of milk producing capacity. The Government of Pakistan established a national policy for cattle breeding, which allowed relative breeding for both native and non-descriptive breeds of cattle (Ali et al., 2014) through use of exotic semen (Khan and Rehman, 1994). Two breeding strategies are available for genetic improvement of cattle i.e., selective breeding within the breed and crossbreeding among the breeds (Falconer and Mackey, 1996). The government of Pakistan is encouraging the import of exotic breeds of dairy cattle with the objective that to rear them as pure breed and use for upgrade of the indigenous non-descriptive cattle in order to improve the reproductive and productive traits of indigenous cattle in the country (Kumar et al., 2014; Haque et al., 2011; Sandhu et al., 2011).

In this regard a group of high yielding 175 pregnant heifers and two breeding bulls of Holstein Friesian breed renewed for adequate fertility and high milk producing capacity were imported from Denmark and kept under intensive management conditions in Quetta, Pakistan (Sandhu et al., 2011). Exotic dairy cattle breeds have a long history which dates back to colonial days. The crossbreeding is being applied in the country since 1970 by use of imported semen for Artificial Insemination or by importing breeding bulls of different exotic breeds. During last two decades efforts have been made to improve reproductive and productive efficiency of indigenous cattle (Red Sindhi and Sahiwal) breeds by crossing with exotic breeds through Artificial Insemination (Kumar et al., 2014; Ahmed et al., 1994). The crossbreeding system offers genetic progress in various important traits that drive the dairy industry profitably (Haque et al., 2011) and provides better route to increase the production as much as 2-3 times more than the national average production (Choudhry et al., 1983; Chaudhry, 1992; James, 1993). Calf crop can also be improved through this system (Richard, 2000). Crossbred technology if applied through artificial insemination can reduce the cost input and enhance the productivity of the animal (Griener, 2002).

This system can only be effective if basic infrastructure such as adequate feed supply, disease control and marketing facilities are available (Haque et al., 2011; Umrani 1993). Peri urban area of Karachi is thickly populated with Red Sindhi cattle. When Red Sindhi cows crossed with exotic semen, resulted a good number of cross breed animals are available in and around Karachi. These crossbred animals are considered as high yielding and have power against resistant to parasitic and other infectious diseases. As far as productive and reproductive performance of these animals is concerned no such information has been found in scientific literature. It was observed that some farmers were keeping the records of various traits at the

farms, but have not been utilized for scientific purpose. The present study was therefore designed to collect and analyze the data available at Nagori Dairy Farm, Karachi on reproductive performance of cross breed animals (Holstein Friesian x Red Sindhi 50% blood level) and compares the same with pure Red Sindhi cattle. The results of the present study will help the policy makers to formulate future policies and propagation of crossbreeding program in our local environmental conditions.

MATERIAL AND METHODS

The study was conducted to investigate the reproductive performance of crossbred cows under intensive management condition at Nagori Dairy Farm, Nagori Society, Karachi, which is located 30 Km in the east of Karachi where, twenty crossbred cattle (50% blood ratio each of Holstein Friesian x Red Sindhi) and twenty (20) Red Sindhi cattle were selected at random and utilized for this study. The vaccination and deworming was adopted properly as per schedule at the farm. These animals were fed with wheat straw, seasonal green fodders and concentrate mixture including wheat bran, rice bran, cotton seed cake twice a day, common salt and molasses were also given to the animal. Cattle were milked twice a day; hand milking was practiced at the farm. Lactating, dry, advanced pregnant cattle, young calves, heifers; breeding bulls were categorized and kept in separate sheds. The artificial insemination and natural breeding was practiced at the farm. Data was recorded in each group on a separate Performa specially designed for this purpose.

STATISTICAL ANALYSIS

The data was Analysed Statistically using Standard Statistical methods “T-test” Variance and Standard Deviation.

RESULTS AND DISCUSSION

The study conducted on Red Sindhi and Crossbred cattle to investigate the reproductive and productive traits and trails were described under following headings.

AGE AT PUBERTY AND FIRST CALVING

Mean (\pm SEM) age at puberty and first calving of Red Sindhi and Crossbred cattle is presented in Table 1.

Table 1: Mean (\pm SEM) age at puberty and first calving of Red Sindhi and Crossbred cattle

| Breed | Age at puberty (days) | | Age at first calving (days) | |
|------------|-----------------------|---------------|-----------------------------|----------------|
| | Mean | Range | Mean | Range |
| Red Sindhi | 616.850 \pm 23.50 | 480.0 – 810.0 | 928.35 \pm 31.80 | 726.0 – 1132.0 |
| Cross-bred | 451.650 \pm 21.66 | 300.0 – 720.0 | 796.5 \pm 39.77 | 590.0 – 1059.0 |

A significant (<0.05) difference was found between the groups for both traits. Significantly higher age at puberty and first calving was observed in Red Sindhi than Crossbred cattle.

Table 2: Percentage of calving status, sex of calves and placental delivery of Red Sindhi and Crossbred cattle

| Breed | Calving status | | | | Sex of calves | | | | Placental delivery | | | |
|------------|----------------|-------------|-----------|-------------|---------------|-------------|---------------|-------------|--------------------|-------------|-----------|-------------|
| | Normal (Nos.) | Percent-age | Ab-normal | Per-centage | Male (Nos) | Per-centage | Female (Nos.) | Per-centage | Normal (Nos.) | Per-centage | Ab-normal | Per-centage |
| Red Sindhi | 15 | 75 | 05 | 25 | 10 | 50 | 10 | 50 | 17 | 85 | 3 | 15 |
| Crossbred | 13 | 65 | 07 | 35 | 09 | 45 | 11 | 55 | 16 | 80 | 04 | 20 |

AGE AT PUBERTY

The age at puberty of Pakistani local cattle is higher than the European breeds (Kakar et al., 2004). This can be reduced by crossing of local breed animals with exotic blood. Age at puberty in different breed of cattle ranges from 6 to 20 months of age. Crossbred heifers reached at earlier age of puberty than pure breed cows (John, 2004). The age at puberty in Red Sindhi cattle has been reported as 720 days (Lodhi, 1991). These values are in close agreement with findings of present study, whereas, it was delayed in Sahiwal cattle. The slightly higher values (854 days) have been reported by Abeyagunawardena and Abayawansa (1995) in Zebu cattle. Increased age at puberty in Red Sindhi cattle could be due to the effect of feeding, management, genetic and environmental factors. When cattle breed was crossed with Holstein Frisian (50% blood ratio) the age at puberty was reduced up to 753 days (Syed, 1997). Although it is higher than mean values (451.650 days) for the Crossbred cows (Red Sindhi x HF cattle) found during current study.

Agymang et al. (1991) reported that when Red Sindhi cattle was, crossed with Holstein Frisian the age at puberty was reduced up to 600–660 days, when Zebu cattle crossed with (50–75% blood level) Holstein Frisian (Qureshi et al., 2002), the age at puberty was reduced up to 540 days in the crosses of Red Sindhi with Jersey (Kar et al., 2000). These reports are in close agreements with the results of current study. Molasses, minerals and environmental conditions play a vital role in attaining early maturity (Alam et al., 2001; Nogueira, 2004). The animals under study were well fed and the environmental conditions of the farm were perhaps conducive for attaining early puberty for both pure and cross bred animals.

AGE AT FIRST CALVING

Age at first calving was higher in Zebu cattle than in Crossbred cattle. The age at first calving was 1080 days in Zebu cattle (Joshi et al., 2001) and 1119 days in Red Sindhi cattle (Sheikh and Zelam, 2000), which fall in the range (726.0 – 1132 days) of the current study for Red Sindhi cattle. Reported values for age at first calving in Cholustani and Red Sindhi cattle ranges from 999–1174 days (Choudhry et al., 1983; Sheikh and Zelam, 2000; Souza and Usmani, 1990; Joshi et al., 2001) are in close agreement with the current findings for Red Sindhi cattle.

The higher values were reported for age at first calving (1020

days) in crosses of Friesian x Local Barca breed and (1215 days) Holstein Frisian x Desi cattle (Nahar and Basure, 1992; Haile-Mariam and Makonnen, 1996; Shiferaw et al., 2004) then the results found in current study. These discrepancies in the results could be due to management, nutritional plan and effect of climatic conditions (Nogueira, 2004).

CALVING STATUS, SEX OF CALVES AND PLACENTAL DELIVERY

Percentage of calving status, sex of the calf and placental delivery is presented in Table 2.

The normal calving was found 75% and abnormal 25% in Red Sindhi cattle, whereas in Crossbred cattle normal calving 65% and abnormal 35%. Sex of calves was observed 50% male and 50% female in Red Sindhi. Sex of calves was observed as 45% male and 55% female in Crossbred cattle.

In the current study equal number of male and female calves was recorded in Red Sindhi cattle. However slightly higher percentage of females calves born from the cross breed cows. Similar trend was reported by Kunbhar et al. (2003) in local breeds of cows. The trend regarding normal shading of placenta reported by Kunbhar et al. (2004) was in close agreements with the present results. However, variation in figures for abnormal delivery was reported by some workers (Samo et al., 2003; Kunbhar et al., 2003). This might be due to the deficiency of vitamin A and selenium in ration or hereditary traits of breed. The RFM is an important reproductive disorder in dairy cattle. It causes the great economic losses to dairy farmers due to the reduction in milk production, calf crop and reduced reproductive efficiency of dairy cattle. The incidence of RFM can be reduced by improving the management, supplementation of minerals, and vitamins in feed (Zubair and Ahmad, 2014). The ratio of female calves was higher than male calves in crossbred cows, whereas in Red Sindhi cows the sex ratio was equal in numbers. The percentage of difficult calving and retention of placenta was higher in Crossbred as compared to Red Sindhi cattle. This might be due to the size or weight of calves produced by cross breed animals (Kakar, 2001).

CALVING INTERVAL AND SERVICE PERIOD

Mean (\pm SEM) calving interval and service period in Red Sindhi and Crossbred cattle are presented in Table 3.

The calving interval in Zebu cattle are higher as compared

to crosses of Zebu cattle with European breeds, Calving interval in Zebu (418 days), Red Sindhi (429 days) and Sahiwal cattle (418 days) has been reported by various authors (Qureshi, 2003; Nahar and Basure, 1992), are in agreement with the figures of present study for Red Sindhi cattle. While the findings (515.28, 674.57 days) of Mustafa et al. (2004) and Khatri et al. (2004) were higher than the current results for Red Sindhi cattle. Shorter calving interval (380.0±36.6 days) was reported by Abeyagunawardena and Abeyawansa (1995) in Zebu cattle than the current findings in Red Sindhi cows.

Table 3: Mean (±SEM) values of calving interval and service period of Red Sindhi and Crossbred Cattle

| Breed | Calving interval (days) | | Service period (days) | |
|------------|-------------------------|-------------|-----------------------|------------|
| | Mean | Range | Mean | Range |
| Red Sindhi | 413.050 ± 10.362 | 340.0-510.0 | 124.15 ± 10.162 | 60.0-230.0 |
| Crossbred | 372.200 ± 7.486 | 302.0-423.0 | 181.700 ± 59.199 | 42.00-950 |

A significant (<0.05) difference was found between the breeds for calving interval and non-significant (>0.05) difference found for service period.

The calving interval of 380, 384 and 388 days was found when Red Sindhi cattle was crossed with Friesian cattle Zebu x Jersey and Zebu x Barca cattle respectively (Yazdani and Paksh, 1997; Haile-Mariam and Makonnen, 1996). These results are in line with the figures of current study. Slightly lower (355±14.5 days) values were found in 50% Boran Crossbred cattle and Holstein Friesian (Agyemang et al., 1991) than the results recorded in current study. Shiferaw et al. (2004) reported 551.82 days calving interval, which is higher than the current observations. The higher values may be because of the management factors.

POSTPARTUM ESTRUS PERIOD

Mean (±SEM) postpartum estrus period of Red Sindhi and Crossbred cattle are presented in Table 4.

Table 4: Mean (±SEM) values of postpartum estrus period in Red Sindhi and Crossbred Cattle

| Breed | Postpartum estrus period (days) | |
|------------|---------------------------------|------------|
| | Mean | Range |
| Red Sindhi | 105.65 ± 9.004 | 42.0-230.0 |
| Crossbreed | 45.300 ± 5.671 | 20.0-120.0 |

A significant (<0.05) difference was found between the breeds for the traits. Significantly higher postpartum estrus period was observed in Red Sindhi than Crossbred cattle.

The post-partum estrus period has been reported 24-76 days in Zebu cattle and 50.26±2.28 days in Holstein Friesian cows (Abeyagunawardena and Abayawansa, 1995; Khan and Rehman, 2000). These findings are lower than the results obtained during current finding for Red Sindhi

cattle. Whereas a higher values (211.5 ± 132.2) days) for post-partum period was recorded in Sahiwal cattle.

In the crosses of Tharparkar cattle the post-partum period was recorded as 97.99 ± 23.47 days. The similar values (90 days) were reported by Ashraf et al. (2000) in crossing of local breed x Red Sindhi cows. The results were reported 120.75±18.21days in cross bred cattle (Haque et al., 2011). The reported figures are in range with the results of present study whereas, higher values (154.8 ± 52 days) was reported by Zaman and Ahmed (1994) in Crossbred cattle. Post-partum estrus period is very important reproductive trait in dairy animals (Haque et al., 2011). The postpartum breeding should be delayed up to 60 to 90 days after parturition in cows, because during this period the uterus undergoes recovery and preparation for next conception.

GESTATION PERIOD AND DRY PERIOD

Mean (±SEM) gestation period and dry period for Red Sindhi and Crossbred cattle are presented in Table 5. A significant (<0.05) difference was found in gestation period and non-significant (0.05>) difference found in dry period between the breeds.

Table 5: Mean (±SEM) Gestation period and Dry period of Red Sindhi and Crossbred Cattle

| Breed | Gestation period (Days) | | Dry period (Days) | |
|------------|-------------------------|-------------|-------------------|------------|
| | Mean | Range | Mean | Range |
| Red Sindhi | 280.200 ± 0.596 | 275.0-288.0 | 89.700 ± 0.596 | 60.0-1200 |
| Crossbred | 277.35 ± 1.155 | 270.0-288.0 | 86.950 ± 5.504 | 45.0-140.0 |

GESTATION PERIOD

Gestation length of any domestic species is determined by genetic makeup and offers very low scope for manipulation. A gestation period from 272–283 days was reported by many workers (Haque et al., 2011; Abeygunawardena and Abayawansa, 1995; Mustafa et al., 2003; Banerjee and Banerjee, 2003; Haile-Mariam and Maknnen, 1996; Hayatnagarkar and Deshpande, 1993) are in close agreement to the findings of present study for Red Sindhi and Crossbred cattle.

DRY PERIOD

There seems to be a great variation in dry period of local and exotic breeds of cattle. The dry period of 89 – 1200 days for Red Sindhi and 86 – 140 days in Crossbred cattle was found in present study. The dry period was reported from 75–1200 days in the literature in different breeds of cows (Haque et al., 2011; Qureshi et al., 2002; Kathri et al., 2004; Ahmad et al., 2003; Kakar, 2001). However, the mean values (89 days) for Red Sindhi and (86 days) Crossbred cattle found in the current study are lower than the information available in the literature. This reflects the

scope of crossbreeding program in urban and peri-urban areas of the province of Sindh.

MILK YIELD PER LACTATION

Mean (\pm SEM) milk yield per lactation for Red Sindhi and Crossbred cattle are presented in Table 6.

Table 6: Mean (\pm SEM) daily milk yield and milk yield per lactation in Red Sindhi and Crossbred Cattle

| Breed | Milk yield per lactation (Kg) | |
|------------|-------------------------------|---------------|
| | Mean | Range |
| Red Sindhi | 3973.2 \pm 137.209 | 3000.0–5187.0 |
| Crossbred | 6052.050 \pm 275.444 | 4046.0–9780.0 |

A significant (<0.05) difference was found between groups for the traits. Significantly higher milk yield per lactation recorded in Crossbred cattle than Red Sindhi cattle.

Milk yield is a multifactorial trait which dependent on genetic, breed, age, parity, stage of lactation, season, health status, nutrition, management and staff itself involved (Ali et al., 2014).

Lactation yield of indigenous breed is lower than exotic pure and crossbreed cattle (Shettar and Govindaiah, 1999). The milk yield of Red Sindhi cattle is also variable as reported by various authors (Khatri, 2002; Joshi et al., 2001). The findings of present study are in line with the results of Pyrhote et al. (1992). Whereas, figures reported by Joshi et al. (2001) and Sirrajuddin and Rehman (1999) are lower than the current findings of study. The discrepancy between the reports might have been due to environmental conditions prevailing in the area when study was conducted and reported by various authors mentioned above. The milk yield per lactation of Crossbred cattle reported by Shettar and Govindah (1999) and Ashraf et al. (2000) is also variable. The findings of present study are in same line with those of Schmitz-Hsu (1997) whereas; figures reported by other workers (Nahar and Basure, 1992; Kakar, 2001) are lower than the results of current study.

It has been observed during present study that the milk yield per lactation was recorded higher in Red Sindhi and crosses of Red Sindhi x Holstein Friesian as contrast to previous results for same breed. This may be due to the farm is running on commercial basis by private sector, farm is well managed animals were well fed; vaccination program and health care was followed properly. It is also observed that the animals were not rebred up to 3 months after parturition with the aim that to get maximum milk production per lactation.

CONCLUSIONS

It is concluded that crossbreed cows considered superior in breeding efficiency as compare to local cattle breed.

Crossing of Red Sindhi cows with Holstein Friesian (50% blood ratio) proved well and had no noticeable problems. More than 35% increase in the milk yield was obtained in the crossing of Red Sindhi cows. Crossbreeding should be limited to non-descriptive cattle. Exotic blood level may be maintained at 50%. Management practices should be improved on scientific line. Artificial Insemination with sexual health control program may be launched at farm level.

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