

Development of Crossbred Cattle in India: A Review

Rajesh Wakchaure¹, Subha Ganguly², Parveez Ahmad Para³, Praveen Kumar Praveen⁴, Avinash Kumar⁵,
Subhash Sharma⁶

¹Associate Professor, Department of Animal Genetics & Breeding, ²Associate Professor & Head, Department of Veterinary Microbiology, ³Associate Professor, Department of Livestock Products Technology, ⁴Assistant Professor, Department of Veterinary Public Health & Epidemiology, ⁵Assistant Professor, Department of Veterinary Pharmacology & Toxicology, ⁶Assistant Professor, Department of Veterinary Parasitology, Arawali Veterinary College (Affiliated with Rajasthan University of Veterinary and Animal Sciences, Bikaner) N.H. – 11 Jaipur Road, V.P.O. Bajor, Dist. Sikar, Pin – 332001, Rajasthan, India

Abstract-- The formation of new crossbred cattle breeds to increase milk production was started in India because of crossbred cattle were more economical and gave higher milk yield than the indigenous cows and increase the income of a farmers, dairy entrepreneurs and provide beneficial and round the year employment to them. Therefore, population of crossbred cows should be increased simultaneously with Artificial Insemination programme to increase profitability to the farmers and dairy industry.

Keywords—Artificial insemination, Cross bred cattle, Milk production

I. INTRODUCTION

Crossbreeding is mating of animals from different established breeds. The progeny produced is called crossbred. India have vast populations of 199.1 million cattle population, which includes 39.73 millions crossbred. The exotic/crossbred milch cattle increased from 14.4 million to 19.42 million, an increase of 34.78 % .(19th Livestock Census- 2012). Crossbreeding programme of dairy cattle has played significant role in attaining India's top position as highest milk producer country of the world. India ranks first in world milk production, increasing its production from 17 million tonnes in 1950-51 to about 137.69 million tonnes in 2013-14. The per capita availability of milk in India in 2013-14 was around 307 grams which is more than the world average 294 grams per day (Economic Survey- 2014-15). This resulted through crossing Indian descript and non-descript cattle with exotic dairy breeds primarily Holstein Friesian, Jersey and Brown Swiss breed. India possesses the largest cattle and buffalo population in the world but average milk production per cow or buffalo is very low in comparison with advanced countries. Low milk production in India is probably due to low genetic potential for milk production, poor nutrition, farm management, unfavorable agro climatic conditions, poor veterinary and extension services (Dhara *et al.*, 2006).

India has increased milk yield by 4 to 6 % /year over the past 20 year (Kurien, 1987) primarily by mating high quality dairy bulls to local cows to attain higher milk yielding cows. The average daily milk yield for crossbred cattle is 7.1 kg per day, but still significantly lesser than the United Kingdom, United States and Israel are at 25.6, 32.8 and 38.6 kg per day, respectively. (Kapoor, 2014). Crossbreeding programmes initiated during the 1950s in India between indigenous and exotic cattle mainly with Holstein Friesian (HF) and Jersey for increase in milk production. During this crossbreeding experiments evolution of a new strains of crossbred cattle, *viz.*, Taylor, Jersind, Jerthar, Karan Swiss, Karan Fries, Sunandini, Frieswal, Phule-Triveni and Vrindavani cattle capable of producing more milk than native breeds.

II. HISTORY OF CROSSBREEDING

Crossbreeding work started in India as early as 1875, near Patna using Shorthorn bull on local cows and the “Taylor” breed of cattle was formed (Sinha, 1951). The average milk yield of 5-6 liters/day. These animals are black, grey or red in colour. Crossbreeding work on more scientific lines was initiated between 1910 and 1932 at the Imperial Dairy Research Institute at Bangalore, Agricultural Institute at Pusa, Livestock Research Station at Hosur and Military Dairy Farms at Allahabad. At Allahabad Agricultural Institute during 1924-1934, the crossbreeding work was started using indigenous breeds like Sahiwal, Gir, Haryana, Kankrej and Red Sindhi cows with exotic breeds like Holstein Friesian, Jersey and Brown Swiss sires. Since 1934, the crossbreeding work was limited to Red Sindhi and Jersey having 3/8 to 5/8 Jersey inheritances and a new breed of cattle “Jersindh” was developed. At Bangluru, Tharparkar cows were crossed with Jersey bulls and a new breed of cattle “Jerthar” was developed.

In 1963, the bilateral project was Indo-Swiss Project now named Kerala Livestock Development Board (KLDB) was started at Kerala using Brown Swiss and Jersey (5/8) on local Non-descript cows and a new breed of cattle "Sunandini" developed. Sunandini is a multipurpose breed for milk, draft and meat, this breed is now becoming exclusively a milch breed (Chacko, 1994). The overall lactation milk yield was 2435 kg in 280 days with 3.89 % fat. In 1963 at NDRI, Karnal crossbreeding of Sahiwal and Red Sindhi with Brown Swiss were initiated to evolve a new dairy breed. Brown Swiss breed famous for its high milk yield, better heat tolerance and draught capacity was chosen, the various crossbred groups were formed which had not shown significant heterosis for milk yield. All the various crossbred groups were merged and selective breeding was carried out. The Brown Swiss inheritance varied between 50-75 % and the rest from Sahiwal cattle, was the next best crossbred group (Thiagarajan, 2014). The creation of synthetic population following selection resulted into a new breed of cattle "Karan Swiss" in 1980. High producing crossbred females will produce 5000 to 6000 kg milk yield with a 4.78 % butterfat during lactation. The Karan Swiss breed is usually light gray to dark brown in color. In 1971 at NDRI, Karnal crossbreeding Holstein Friesian, Jersey and Brown Swiss sires semen was used on Tharparkar cows. The various crossbred groups were formed which had not shown significant heterosis for milk yield. All the various crossbred groups were merged and selective breeding was carried out. The Holstein Friesian inheritance varied between 50-62.5 % and the rest from Tharparkar was the next best crossbred group (Thiagarajan, 2014). The creation of synthetic population following selection resulted into a new breed of cattle "Karan Fries". The colour of Karan Fries breed predominantly of black patches and sometimes is completely dark with white patches on forehead and tail. The average 1st lactation milk yield was 3619 kg in 305 days. The average fat % ranged between 4.10 and 4.17 and SNF ranged between 8.58 and 8.75 %. The Project Directorate on Cattle (PDC), Meerut has developed a National crossbred cattle "Frieswal" a Holstein Friesian - Sahiwal cattle cross, yielding 4000 kg of milk with 4% butter fat in a lactation of 300 days (Directory of Frieswal Bulls, 2011). The chief body colour of Frieswal cattle was black and white. Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri of district Ahmednagar, Maharashtra has developed a triple crossbred cow breed named "Phule Triveni" giving milk yield of 3000 to 3500 liter/lactation with 4% of fat. The new breed has been developed by crossing Holstein Friesian (50 per cent), Jersey (25 per cent) and Gir (25 per cent) breeds (Doiphode *et al.*, 2008).

The genetic constitution of "Vrindavani" cattle carries 50–75% inheritance from exotic cattle breeds concerning Holstein-Friesian, Jersey and Brown Swiss and 25–50% from indigenous Haryana breed. The Vrindavani cattle exhibit almost all possible coat colors in addition to roan, light-dark brown, black and white and brown and white. The Vrindavani cattle yield around 3,000 kg milk in 305 days of lactation with 4–4.5% fat (DARE/ICAR, Annual Report, 2007-08).

Advantages of Crossbreeding

Increase in crossbred cattle population, milk production and per capita of milk availability, lactation length, growth rate, decrease in age at puberty, age at first calving and calving interval (Tomar, 2009), higher birth weight of calves, better growth rates, better reproductive efficiency, advantage of breed complementarity and non-additive effects (dominance and epistatic) thus leading to heterosis (hybrid vigor). Heterosis tends to be most important for lowly heritable traits such as fertility and survival. Heterosis makes crossbred animals more productive and better than either of the parental breeds. Crossbred animals are docile, can be easily handled and more suited for machine milking, Heat detection and artificial insemination is easier in cows. Price of crossbred cow milk is less in comparison to native breeds.

Disadvantages of Crossbreeding

Primary investment and maintenance expenditure is high. For less availability of good quality of feed and fodder the crossbred animals are susceptible to contagious diseases like Foot and Mouth disease, Babesiosis, Theileriosis, Mastitis, Milk fever, Ketosis etc. The crossbred animals are also most susceptible for heat stress, shock etc. Very high culling rate persists in crossbred's males (40-70 %) due to poor libido, semen quality and freezability (Sethi, 1989.) Cross breeding requires maintenance of two or more pure breeds in order to produce the cross breeds. Disposal value of surplus crossbred male is trivial.

Future Breeding Strategies for Development of Crossbred Cattle

Strengthen the existing Artificial Insemination (AI) networking facilities to provide doorstep delivery to the farmers. Efforts should be made to improve the conception rate from AI. Rigorous selection especially of males with very high genetic merit along with good semen quality has to be done to bring faster genetic improvement. Proper replacement rate in females has also to be maintained to have optimum size of the herd.

The selection of males and females should not be done on milk yield alone, but also for other adaptive traits as well as higher fat and SNF percentage. The native cows of well defined breeds should not be used for crossbreeding rather than non-descript animals should be used under crossbreeding programme. To make available males and frozen semen to various developmental agencies for sustaining and improving the performance of crossbred cattle in tropical countries. In the different agro climatic zones of countries practices like better breeding, feeding and management, veterinary and extension services should be developed.

III. CONCLUSIONS

The crossbreeding of non-descript zebu cows with semen of exotic dairy cattle breeds has resulted in enhancing milk production by 5 to 8 times to that of non-descript cows, reducing age at first calving and shortening calving intervals in first generation crossbred progenies. However, in the absence of clear-cut breeding plans and programmes, further breeding of F₁ progeny has resulted in subsequent generations of F₂ and beyond in F₂ generations the advantages observed in the F₁ generation have markedly deteriorated, causing great disappointment among livestock farmer society regarding the value of cross breeding. The use of crossbreeding can be an effective tool for replacing non descript animals, for this purpose Holstein Friesian and Jersey inheritance with non descript animals should be maintained around 50-62.5% exotic inheritance level for better production performance. To sustain the improved productivity of crossbreds and to control the decline in performance in subsequent generations therefore, requires a well breeding policy along with availability of progeny tested high quality breeding bulls in sufficient numbers, infrastructure on Artificial Insemination and animal health, improved feeding and management practices, door to door delivery of veterinary and extension services, programme monitoring and regulatory mechanisms necessary to obtain higher milk production.

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***Corresponding Author: Dr. Subha Ganguly, Hony. Senior Editorial/ Advisory Board Member (IJETA E Online); E-mail: ganguly38@gmail.com**