

ICAR-CIRB produces seven clones of a superior buffalo breeding bull

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Buffalo, an important Indian dairy animal, contributes significantly to milk, meat and draught power. India is ranked first in global total milk production by producing 187 million tonnes of milk per annum, in which buffalo contributes 49% (91 million tonnes). Despite significant contributions to the country's milk production, the number of high milk-producing buffaloes is limited. One of the major obstacles that limit the faster genetic improvement of this valued farm animal is the shortage of proven bulls to mitigate the demand of semen for breeding. Presently, the country has about 1200 breeding buffalo bulls, which produce 40 million semen doses annually for artificial insemination. It is estimated that by 2024–25, India shall require 5600 bulls to produce 140 million semen doses annually for inseminating 70 million breedable buffaloes. Keeping in view, for compensating the shortage of bulls by using alternate reproductive technologies that produce superior males in a short time, the Indian Council of Agricultural

Research has funded a project on buffalo bull cloning. This project aims to produce multiple clones of superior bulls, particularly of Murrah breed which is famous for its potential to produce a high quantity of milk.

Buffalo cloning is an asexual means of reproduction that produces genetically identical copies of a desirable buffalo without natural or artificial mating and any genome modification. Buffalo cloning is one of the assisted reproductive techniques, in which one somatic cell is fused with enucleated oocyte/oocytes to produce blastocyst stage embryos. The produced blastocysts are transferred into the foster mothers to carry cloned pregnancies and to deliver cloned calves. The application of this technology to current buffalo breeding strategies will have a substantial impact on selection intensity and subsequent genetic gain.

India's first cloned buffalo was born on 6 February 2009, and thereafter several cloned buffaloes have been produced using different types of somatic cells.

Despite the successful production of clones, an extensive application of buffalo cloning technology has not been achieved so far in the country due to extremely low efficiency (<2% healthy live birth rate). Also, multiple clones (more than five) have not been produced from a single buffalo. Recently, the Central Institute for Research on Buffaloes (CIRB) achieved two successes in buffalo cloning research: (1) production of seven clones from a single superior bull, named M-29 (Figure 1), and (2) birth of a re-cloned calf of a cloned bull, named Hisar-Gaurav (Figure 2). These achievements are first reports of such kind in buffalo cloning research worldwide. The genotype of cloned calves was confirmed by microsatellite analysis (parentage verification). The produced clones have normal physiological parameters such as blood hematological indices, respiration rate, body temperature and heart rate. These achievements were released to the news media on the occasion of the virtual 92nd Foundation Day of Indian Council of Agricultural Research held at Krishi Bhawan, New Delhi on 16 July 2020.

The Institute has produced 11,000 frozen semen doses and 25 progenies of Hisar-Gaurav. The Assamese cloned bull, which was produced in 2017, has been trained to produce semen, and to date, 1200 semen doses have been produced. We also demonstrated that the cloned bulls have similar fertility with the donors and other non-cloned breeding bulls. So far, CIRB has produced 10 cloned buffalo bulls, which can produce 10–15 lakh semen doses that can inseminate 5–7 lakh buffaloes for improving their genetic potentials.

This technique shall go a long way to improve buffalo germplasm and to increase total milk production in the country. High productive animals have multiple benefits as they reduce the requirement of animal feed, labour and housing besides reducing methane production to save the environment.

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Figure 1. Seven clones (left to right) of a superior breeding bull (M-29) of Murrah breed, and a re-cloned calf (rightmost) of cloned bull (Hisar-Gaurav). All cloned buffaloes were born between October 2019 and January 2020.



Figure 2. Cloned bull Hisar-Gaurav (left) was produced in 2015, and his re-cloned calf was born in January 2020.