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Scenario of Artificial Insemination of Buffalo in India

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1. Introduction

112 million buffaloes in India contribute to 54.6% of their global population producing 45.32% of milk and 18% of India's total meat production (Animal Husbandry Statistics, 2024, DAHD). Buffalo has a great ability to produce high fat milk with longer reproductive life which is achieved even when nourished with low quality roughage and minimum maintenance cost. It is also a choice for farmers of the country as they can get advantage as the cow slaughter is banned here.

The 1st generation Reproductive biotechnology i.e. Artificial Insemination (AI) has proven the most successful and effective reproductive innovation that is having a significant influence in India and throughout the world. In addition to reducing the spread of venereal diseases, AI has significantly enhanced animal production. In India, for the first time AI was done by Dr. Sampath Kumaran in August, 1939 at Palace Dairy Farm, Mysore. The first buffalo calf through AI was born in 1943 at the Allahabad Agricultural Institute. AI was originally used in India in 1939, but it wasn't until the third phase of Operation Flood in 1985 that it was made more intense. It is very important to note that the success in enhancement of buffalo milk yield and production is also of the same order as in the case of cow, although in buffaloes there is no AI with exotic germplasm (Singh, 2016).

Apart from revolutionizing the process of animal breeding, AI has also helped in disseminating the superior genetic material of High producing bulls all over the world being a cost effective option rather than the import of live animals. The breeders can achieve improved breed in short time, farmers can decide to bred by deciding from the indexes of breeding value. In India, there are total 35 Buffalo breeding farms, 56 Semen production centres. The contribution of exotic, crossbred, indigenous and buffalo bulls to total production of frozen semen doses during 2016-17 were 33.3, 24.8, 13.3 and 28.6%, respectively.

2. Avenues for development and improvement of AI techniques in buffaloes

Cattle as available in developed countries and in the west is studied thoroughly but as the availability of buffalo is only restricted to few parts of world in Asia, Africa and Europe and hence is studied less and also the newer techniques are not much explored in these animals.

3. Challenge`s for AI in buffalo

3.1 Estrous detection failure

Buffalo are shy, poor breeders. Buffalo shows less overt signs, rare homosexual behavior (Agarwal SK, Purbey LN., 1983). It becomes a challenge for performing AI. Various biochemical are now explored for estrus detection like *p-Cresol* (Karthikeyan K, *et al*, 2014) few minerals (Devi I *et al*, 2016). Electronic devices designed to identify elevated physical activity have been available in some countries (Roelofs JB, *et al*, 2015) in the form neck mounted collars and the leg mounted pedometers are commonly used in dairy and beef cattle but can be implemented in buffaloes. Pressure

sensing radio telemetric Heat-Watch system are however, used recently (Porto-Filho RM, *et al.*, 2014)

3.2 Estrus synchronization

Baruselli *et al*. in (2013) reported first Estrus synchronization study since then even after 45 yrs, there are considerable limitations in buffalo synchronization and the results are poor as compared to cattle. Similar to cattle, estrus synchronization approaches in the buffalo have used prostaglandins, progestins and GnRH based protocols in combination with other hormones such as Estradiol, PMSG, insulin, etc. The different protocols have variable estrus and conception rate depending on various factors like parity, heifer health/ BCS, season of breeding, etc. The use of a particular approach would depend upon many factors which should be considered prior to use of a particular product. The detailed description has been mentioned by Purohit et al, 2019, De Rensis, F et al, 2007 and Barile, V. L., 2005.Estrous synchronization of buffalo`s may help in improvement in problem of estrous detection in commercial farms.

4. Methods for enhancing Buffalo's AI programs

4.1 Cloning of Buffalo Male Germplasm

It is now possible to clone superior buffalo bulls and bulls that have undergone testing in the future using somatic cells that have been kept in frozen semen. In this context, a streamlined method of hand-made cloning has demonstrated potential following its successful implementation at the National Dairy Research Institute (NDRI), Karnal. (Selokar NL et al, 2014). Elite female buffaloes are being created by cloning as mothers as part of another project at CIRB, Hisar. Thus transfer of these elite germplasm to different herd will may lead overall increase in productivity of herd. The INDUSCHIP was created by the National Dairy Development Board to select elite animals of native breeds, and 28315 animals have been genotyped with the chip to create a referral population. BUFFCHIP was created for the first time in history to select buffaloes genetically, and 8,000 buffaloes have been genotyped thus far to create a referral population.

4.2 Buffalo Semen from Bull to Insemination

Due to its intrinsic traits of resistance to common infections, high-quality A2 casein milk, production on low rations, and tolerance to hard climates, buffalo is viewed as the milch animal of choice for many nations worldwide in the years to come (Singh & Balhara, 2016). At the same time, this will justify the supply of massive quantities of frozen semen in order to expedite the upgrading of the great majority of the unremarkable Buffalo population.

Research on frozen semen quality is important for the efficient execution of any AI program as it is a significant determinant of AI success. Cattle-specific semen processing methods were mostly used as buffalo-specific semen parameters were lacking. Better techniques for freezing buffalo semen have been established as a consequence to research conducted over the years, particularly in India.

5. Conclusion

In order to produce quality bulls and bull mothers quickly, it is necessary to establish effective semen freezing methods for increased post thaw motility, lower the sperm dosage for a viable insemination, and use contemporary cloning and embryo transfer technology. To increase conception rates, dependable estrus synchronization techniques for fixed time AI or alternatively effective estrus detection tools are required. The use of sexed semen in superior buffaloes to produce bull calves can be a source of superior bulls to satisfy the needs of the Buffalo population for natural services and frozen-semen AI. Looking towards the requirement and need of India, we need to develop personalized and India made sex sorting technique for buffalo semen sorting.

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