

Challenges in production of semen from Indigenous, crossbred and buffalo bulls

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Introduction

- Though *Bubalus bubalis* and *Bos taurus/indicus* belong to the same family bovidae yet there are basic differences in these two species.
- Buffalo has 25 pairs of chromosomes as compared to bulls (30 pairs)
- Buffalo has fewer sweat glands on the body surface and sweats less so becomes more uncomfortable if exposed to hot conditions
- Buffalo has a thin layer of fat under the skin in addition to the black skin which absorbs heat if exposed to sun and becomes more uncomfortable

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- Buffalo depends on surface water evaporation for maintaining the homeothermy
- In order to utilize buffalo bulls maximally for semen production, we have to make some changes in the management.
- Putting showers or foggers in bull shed and exhaust fans so that the shed remains cool
- Providing cool water all round the day for drinking
- Providing succulent fodder.
- Providing proper shed which can protect from high ambient temperature, and radiation effect

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- Thermal stress, (high humidity, high ambient temperature), high radiation effect in summer affect spermatogenesis.
- High amount of semen ejaculates get rejected during June to august.
- During the same period lot of rejection of frozen semen take place because of low post thaw motility and high abnormal count and high primary abnormalities indicating disturbances in spermatogenesis
- This may be because of increase in testicular temperature

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- Buffalo semen has less electrolyte tolerance
- Buffalo semen has less buffering capacity
- Buffalo semen is compositionally different than cattle semen
- Buffalo semen differs from cattle semen as regards the chemical and biochemical characteristics as well as morphological nature of spermatozoa

Other features

- The scrotal circumference is less, the volume of ejaculate and sperm concentration is also less in buffalo bulls
- The service behavior, mount and type of ejaculatory thrust is also different in buffalo bulls as compared to bulls
- Since the penis is slender and shorter than bulls, buffalo bulls need shorter AV so that the ejaculate is properly collected.

Weight and scrotal circumference in buffalo bulls

Age (years)	Body weight (Kg)	Scrotal circumf (cm)
2	450	26
3	504	28
4	602	29
6	672	30
>6	776	33

The duration of epithelial cell cycles, number of cycles during spermatogenesis and duration of spermatogenesis is different in buffalo bulls as compared to other species

Species	No. of cycles	Duration of cycles (days)	Duration of spermatogenesis (days)
Bull	4.5	13.5	60
Buffalo	4.5	8.6	38
Stallion	4.6	12.2	56
Ram	4.7	10.4	49

Testicular descent	Bull Half way through fetal life	Buffalo Half way through fetal life
Primary spermatocytes in seminiferous tubules	24 weeks	60 weeks
Spermatozoa in seminiferous tubules	32 weeks	80 weeks
Spermatozoa in cuada epididymis	40 weeks	
Spermatozoa in ejaculate	42 weeks	88 weeks
Age at which animal can be used for semen collection	18 months	30 months

Selection of buffalo bulls for breeding

- Buffalo bulls should be selected from the breeding tract of the breed. Keeping in mind the genetics, structural soundness, health status and reproductive soundness of the bulls.



- It has been reported that 28 to 38 percent of Surti bulls are rejected on account of poor semen quality and overall sexual derangement (Kodagali, 1980),.
- However there are less rejections in Murrah bulls for semen freezability (only 4 percent) and for poor libido only 2 percent.

Care during processing of buffalo semen

- As the epithelial cell cycle is faster and the period required from spermatogonium to form spermatozoa is markedly less as compared to bulls, buffalo spermatozoa are very fragile and need delicate handling in processing
- Agitation and rough handling may cause damage to the spermatozoa.
- The processing technique, dilution method, equilibration period etc for buffalo semen shall be different and needs proper attention
- Buffalo sperm does not tolerate ionic buffer, but can tolerate very well the non ionic buffer like TRIS.

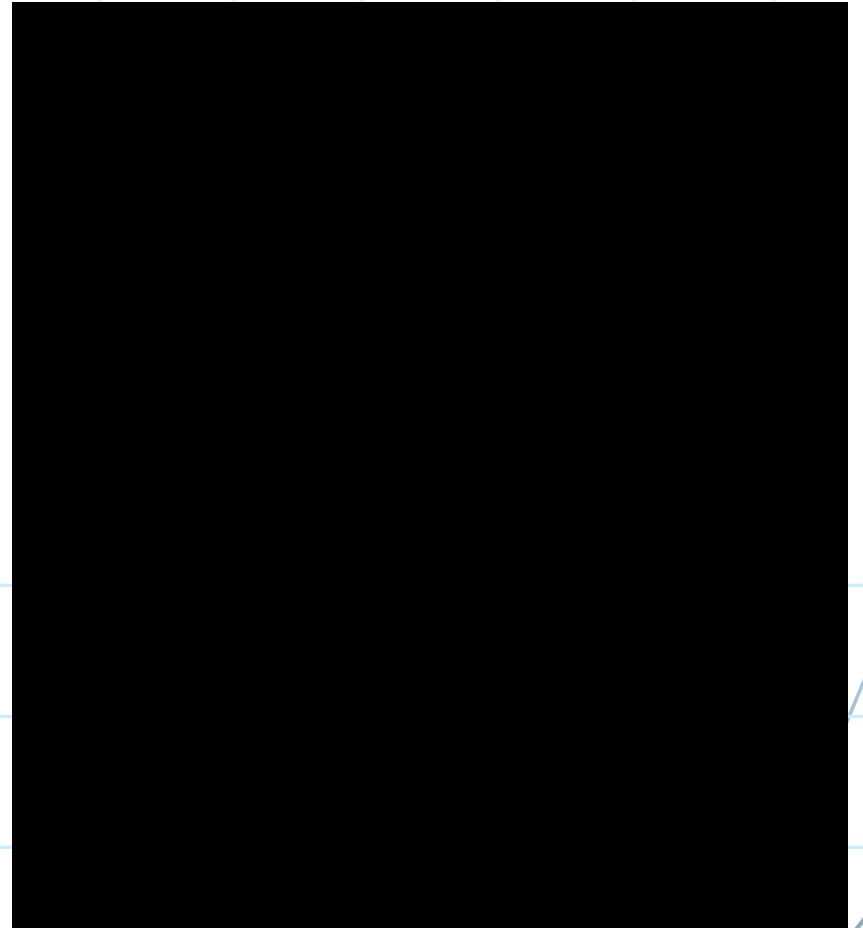
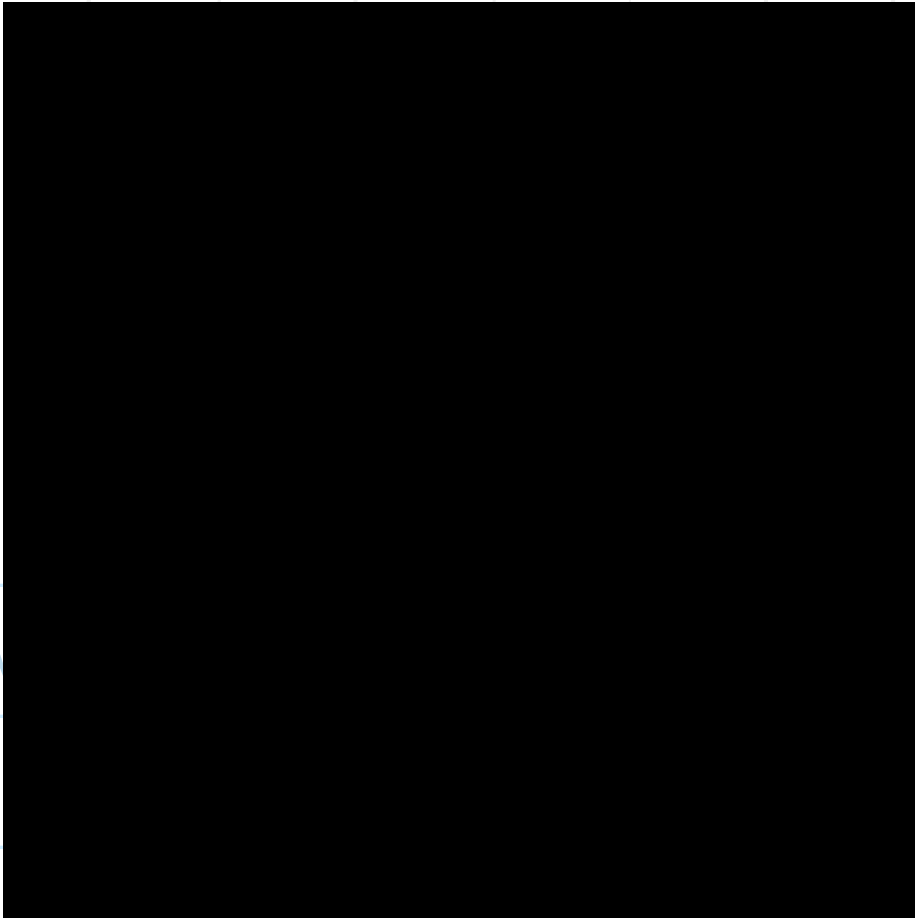
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- Buffalo spermatozoa is very susceptible to osmotic shock, therefore glycerol containing extender should be added slowly and in small batches so that sperm develop tolerance for it.
- Slightest thermal shock also may be damageable to buffalo spermatozoa hence thermal shock shall be avoided while processing the semen
- The buffalo semen needs a shorter equilibration time (3 hours) as compared to normal 5 hours as in case of bulls

PTM

55 %

75 %



Challenges in crossbred bulls

- Crossbreeding in cattle has been widely used in India for genetic improvement of local cattle and to increase milk production.



- Holstein – Friesian xTharparkar, /Sahiwal /Gir. Crossbreds are the most popular for higher milk production.
- Unfortunately problems related with crossbred males have not been addressed, so far properly and so the availability of good crossbred bulls is a limiting factor for cattle improvement.
- The rejection of crossbred bulls is very alarming due to reproductive problems, production of non-freezable and poor quality semen etc.

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- The available reports suggest that more than 50% crossbred young bulls inducted for semen collection programme (at 15-18 months of age) are straightaway rejected for reasons like poor semen quality (including semen motility), poor libido, and poor freezability. Rejection on the basis of poor semen motility, high abnormal sperm count etc is the most prominent reason.
- Various sub fertility traits like poor libido and unacceptable seminal profile were found to be the significant reasons ($p < 0.01$) for culling of the breeding bulls.
- As in case of exotic Holstein Frisian the crossbred also suffer from stress of high ambient temperature and humidity

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- Months of June to August are worst from the point of view of semen production. The production is minimum in these months.
- High amount of the ejaculates are rejected on account of low initial motility abnormal sperm, poor freezability etc especially in the region of north and Western India where the temperatures are extreme as high as 47 to 48°C in summer

Selection of crossbred bulls

- In order to reduce the losses, the crossbred bulls should be selected based on sexual behavior, and quality of semen in addition to genetics and other important traits
- High number of crossbred bulls are getting rejected because of poor libido (sex drive)
- This is possible only when bulls get matured and able to donate the semen
- When the bulls are introduced in semen collection it should be made mandatory to test at least six ejaculates, one each week to test live count, sperm abnormalities and freezability of semen. If they pass all tests then only the bulls should be introduced in regular semen collection
- The crossbred bulls are rejected on account of poor libido 36.46%, poor semen quality 45.42%, poor semen freezability 11.0%

Challenges in Indigenous bulls

- Amongst the Indigenous bulls the most demanded are Sahiwal, Tharparkar, Red-sindhi, and Gir as dairy breeds and Khillar, as Draft breed
- The main difference in these breeds is the late maturity as compared to exotic breeds



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- The age at which the semen of these bulls can be collected is about 30 to 36 months as compared to 18 months in exotic
- The sheath in these breeds is pendulous and prone for injury
- The Indigenous dairy bulls have long reaction time. Some times it is so long that the AVs are changed several times before proper collection

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- High proportion of bulls of dairy breeds are rejected on account of poor libido and shy breeder character
- In draft breed, there is no such problem but they are temperamentally ferocious and need proper training and control
- The semen processing technique, extender, equilibration period and freezing rate is as good as exotic

Thank you