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Editorial: Buffalo (swamp and riverine) production for meat and milk

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Editorial on the Research Topic

Buffalo (swamp and riverine) production for meat and milk

Domestic buffaloes (*Bubalus bubalis*), encompassing swamp and river types are ruminant mammals of the Bovidae family and thrives across many Asian, European and African nations. It has been domesticated primarily near watercourses such as riverbanks in the Asian subcontinent and its popularity is steadily surging as a source of milk, meat, skin and draught (Babar et al., 2012; Minervino et al., 2020). The domestic buffalo is originally an Asian animal and about 98 percent of the global population of around 170 million animals are found in this region, principally in India, Pakistan, China and Southeast Asia and the buffaloes are now reported from 41 countries worldwide. Buffalo breeds contribute a modest three percent of the entire count of recorded mammalian breeds globally (FAO, 2023). Despite its important role as a multipurpose mammal and their invaluable contributions, this species receives inadequate care and attention than it deserves. This gap only prompted the formulation of this Research Topic and was designed to offer a compilation of buffalo performance in diverse locations with the primary objective to publish original research papers on production and reproduction performances of buffaloes under diverse climatic conditions, genomic studies in relation to production and disease aspects as well as its contribution in mitigating poverty.

In the broader context, a comprehensive evaluation of the influence of numerous non-genetic factors becomes imperative to discern appropriate management techniques and selection and formulate effective breeding strategies aimed at genetic improvement (Bashir et al., 2007). In a notable contribution, Tamboli et al. undertook an investigative study on Nili-Ravi buffaloes to identify optimal management approaches as well as selection and breeding methodologies for genetic improvement. Through their study, they advocated that the breeding plan be customized and coordinated with the goal of achieving a high success rate of conception, which could lead to an overall improvement of the reproductive cycle and production performance of the livestock in a herd.

A healthy diet necessitates an acceptable balance of macro-elements such as Calcium and Phosphorus, as well as microelements such as Iron and Copper. Some of these elements have structural roles (for example, Calcium and Phosphorus), whilst others (for

example, Iron or Zinc) are essential for biological activities such as enzymatic reactions, cellular osmotic equilibrium, nerve impulse, and muscular contraction (Junqueira, 1993; Ma et al., 2020). The study carried out by Rodrigues et al. examined how three extensive production systems (during the dry and rainy seasons) and an intensive (feedlot) system affected the muscle mineral profile of water buffaloes in the Eastern Amazon. The documentary demonstrates that meat sourced from animals raised in extensive production systems offers health benefits than meat from animals raised under intensive production systems.

Milk yield efficiency reflects the integrated functional ability of multi-organ systems to biosynthesize fat, protein, and lactose to increase the milk volume by utilizing blood constituents (Bauman et al., 2006). Milk fat, protein yield and nutritional factors can be improved by selective breeding with high estimated breeding values (EBVs), favoring higher milk yield. Nevertheless, the contribution of paternal inheritance towards female progeny performance has been determined to be greater than that of maternal inheritance in Murrah buffaloes (*Bubalus bubalis*). This warrants further understanding of genomic variations underlying the metabolic changes translating into high or low milk yield to identify genomic determinants for efficient milk production that are less known in the realm of buffaloes. In this context, Sikka et al. did functional genome profiling of Murrah buffaloes for milk-production trait by whole blood transcriptome analysis comparing RNA-seq data assembled from high and low milk producing multiparous (5 to 6 parity) animals. Through their study, they gleaned insights into the molecular landscapes underlying milk yield variations. This manuscript highlights the fact that the segregated patterns of gene expression obtained for high and low milk producing buffaloes using the non-invasive method of whole blood transcriptome analysis has emerged as a promising resource consisting of gene network and protein-protein interactions, primarily involved in lactation. These novel revelations have the potential in enhancing the breeding techniques for buffaloes to achieve the necessary milk output.

River buffaloes are sensitive to the majority of cattle-related illnesses. Buffaloes have higher resilience to foot-and-mouth disease (FMD) and Brucellosis compared to cattle. However they have a higher incidence of parasite infections due to their wallowing behavior (Wahid and Rosnina, 2011). In general, the FMD has been accorded priority status in several countries due to its significance and the seropositivity has been observed higher than expected. This suggests the necessity for further research to elucidate the precise role of subclinical animals in FMDV transmission in FMDV-endemic countries with comparable ecological and husbandry contexts. The article authored by Buckle et al. titled “*Detection of Foot-and-Mouth Disease virus in the absence of clinical disease in cattle and buffalo*” provides a great illustration of this and the authors conclusion were that the presence of detectable FMDV RNA on the oral and nasal mucosa of clinically healthy large ruminants underscores the importance of sampling asymptomatic animals as part of surveillance. In essence, the mentioned study contributes significantly to our understanding of the intricate dynamics of FMD transmission and highlights the importance of proactive surveillance involving asymptomatic animals.

Brucellosis is an important health problem that primarily affects water buffaloes. The existence of latent infections, as well as the pathogen’s prolonged incubation, impede the success of eradication efforts focusing on infected animals (Ma et al., 2020). The outcomes of a meta-analysis of Shi et al. revealed that buffalo Brucellosis infection is quite widespread in buffalo herds across the world. Despite the low sero-prevalence of brucellosis in humans and buffaloes, extensive control and preventative measures are required to stop the disease’s spread because of the possible consequences for public health and animal husbandry. Under the current scenario of Global Climate Change (GCC) there is an emerging need to identify the best producing buffaloes under harsh climate. Although water buffaloes have better abilities to withstand hot and humid environment as compared to cattle, however there is need to apply modern genomic technologies to further explore the heat tolerance abilities in buffaloes to mitigate the ever increasing global temperature especially in the Indian sub-continent region.

Overall, the five papers featured in this Research Topic highlighted the various facets of water buffalo production and reproduction performance, delve into genomic investigations aimed at buffalo genetic improvement and disease identification, and underscore the significance of nutritional management to bolster buffalo production. Each of these contributions in this thematic compilation presents prospects for future research endeavors towards the overarching goal of improvement of buffalo productivity.

Author contributions

TK: Conceptualization, Project administration, Validation, Visualization, Writing – original draft. TH: Investigation, Supervision, Validation, Writing – review & editing. LA: Investigation, Resources, Supervision, Writing – review & editing. RR: Conceptualization, Methodology, Validation, Writing – review & editing, Supervision.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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