



International Journal of Veterinary Sciences and Animal Husbandry



ISSN: 2456-2912

NAAS Rating (2026): 4.61

VET 2025; SP-11(8): 96-100

© 2026 VET

www.veterinarypaper.com

Received: 04-05-2026

Accepted: 08-06-2026

J Selvamani

Assistant Professor, Sheep
Breeding Research Station,
Sandynallah, The Nilgiris,
TANUVAS, Tamil Nadu, India

S Satheesh Raja

Assistant Professor, Department
of Livestock Products
Technology, Veterinary College
and Research Institute,
Udumalpet, TANUVAS, Tamil
Nadu, India

Haritha B Pillai

Assistant Professor, Sheep
Breeding Research Station,
Sandynallah, The Nilgiris,
TANUVAS, Tamil Nadu, India

M Boopathy Raja

Assistant Professor, Department
of Animal Husbandry Extension,
Veterinary College & Research
Institute, Tirunelveli,
TANUVAS, Tamil Nadu, India

Pasupathi Karu

Professor and Head, Sheep
Breeding Research Station,
Sandynallah, The Nilgiris,
TANUVAS, Tamil Nadu, India

Corresponding Author:

J Selvamani

Assistant Professor, Sheep
Breeding Research Station,
Sandynallah, The Nilgiris,
TANUVAS, Tamil Nadu, India

Mortality pattern and associated risk factors in Toda buffalo calves under tribal management in the Nilgiris district of Tamil Nadu, India

**J Selvamani, S Satheesh Raja, Haritha B Pillai, M Boopathy Raja and
Pasupathi Karu**

DOI: <https://www.doi.org/10.22271/veterinary.2026.v11.i8Sb.3684>

Abstract

The present study investigated the mortality pattern and associated risk factors in Toda buffalo (*Bubalus bubalis*) calves reared under the traditional tribal production system in the Nilgiris district of Tamil Nadu. A longitudinal observational study was conducted during 2023-2026, and 240 calf mortality cases were analysed using descriptive statistics and Pearson's Chi-square test. Season, age, sex, and cause of death showed significant associations with calf mortality ($p < 0.05$). The highest mortality occurred during the rainy season (62.10%), followed by winter (30.40%) and summer (7.50%). Calves aged 1-3 months accounted for the highest mortality (51.25%), indicating that the neonatal period is the most vulnerable stage. Calf scours (48.75%) was identified as the leading cause of death, followed by enteritis (29.58%). Male calves experienced significantly higher mortality (56.70%) than female calves. The findings indicate that environmental conditions, gastrointestinal diseases, and traditional management practices are major determinants of calf survival. Strengthening neonatal health care, diarrhoea control, farmer awareness, and veterinary support is essential for improving calf survival and conserving the endangered Toda buffalo breed.

Keywords: Toda buffalo, calf mortality, tribal management, risk factors, calf scours, enteritis, Nilgiris, indigenous buffalo, neonatal calf, conservation

1. Introduction

The Toda buffalo (*Bubalus bubalis*) is one of the most unique indigenous buffalo breeds of India, confined exclusively to the Nilgiri hills of Tamil Nadu and traditionally reared by the Toda tribe, an ancient pastoral community of the Western Ghats. The breed has evolved over centuries under the unique ecological conditions of the high-altitude montane ecosystem and is well adapted to the cool climate, heavy rainfall, undulating terrain, and natural grasslands of the Nilgiris. The Toda buffalo is an indigenous buffalo breed endemic to the upper Nilgiris of Tamil Nadu and has evolved under the unique ecological conditions of high-altitude grasslands and shola forests. The breed possesses distinct phenotypic characteristics, remarkable adaptation to cold climatic conditions, and is maintained under an extensive pastoral production system by the Toda tribe (Selvamani *et al.*, 2026b; Nivsarkar *et al.*, 2000; NBAGR, 2023) [10, 6, 4].

Toda buffaloes occupy a unique position among India's indigenous buffalo breeds because they are maintained primarily under a traditional pastoral production system rather than an intensive dairy farming system. Under traditional management, Toda buffaloes are reared in Toda Munds with extensive grazing and natural suckling, exhibiting moderate milk production and excellent adaptation to low-input production systems (Selvamani *et al.*, 2026a) [9]. Unlike commercial dairy buffaloes, Toda buffaloes are rarely milked for regular household consumption, and calves are allowed to suckle directly from their dams. Buffaloes also possess immense cultural and religious significance among the Toda people, where they form an integral component of traditional rituals, temple ceremonies, and socio-economic identity (Rivers, 1906; Walker, 1986) [8, 11].

India possesses the largest buffalo population in the world, contributing substantially to global milk production and rural livelihoods. Indigenous buffalo breeds are increasingly recognized for their valuable adaptive traits, including disease resistance, environmental resilience, and ability to efficiently utilize low-quality feed resources under marginal production systems. However, several native buffalo breeds have experienced a steady decline in population owing to habitat degradation, reduction in grazing lands, changing socio-economic conditions, indiscriminate crossbreeding, and inadequate scientific management practices (FAO, 2023; NBAGR, 2023) [3, 4]. Among these, the Toda buffalo has been categorised as an endangered indigenous breed, making its conservation an important national priority.

One of the major factors limiting the sustainable conservation and population growth of endangered livestock breeds is calf mortality. Calf mortality not only reduces herd replacement but also results in considerable economic losses through decreased lifetime productivity, lower reproductive efficiency, and erosion of valuable genetic resources. In small and endangered populations such as the Toda buffalo, every calf lost represents a permanent reduction in the effective breeding population. Therefore, improving calf survival is fundamental to both breed conservation and sustainable livestock production.

Mortality among buffalo calves is influenced by a complex interaction of genetic, nutritional, environmental, infectious, and management-related factors. Numerous studies have reported that the neonatal and pre-weaning periods constitute the most vulnerable stages of life, during which calves are highly susceptible to gastrointestinal infections, respiratory diseases, nutritional disorders, and environmental stress (Cho and Yoon, 2014; Constable *et al.*, 2017) [1, 2]. Calf diarrhoea (calf scours) remains one of the leading causes of mortality worldwide, accounting for significant economic losses in both cattle and buffalo production systems. In addition to infectious agents, inadequate colostrum intake, poor hygiene, improper feeding practices, cold stress, and delayed veterinary intervention considerably increase the risk of calf mortality.

Field observations have also indicated that traditional beliefs and limited awareness regarding calf diseases contribute to increased mortality. Farmers frequently interpret the thread-like curdled milk particles present in diarrhoeic faeces as intestinal worms and consequently administer anthelmintic drugs instead of appropriate rehydration therapy and veterinary treatment. Such misconceptions delay timely intervention, allowing diarrhoeal diseases to progress to severe dehydration and death. These observations emphasise the importance of strengthening veterinary extension programmes and improving awareness regarding neonatal calf management among the Toda community.

Although several studies have described the phenotypic characteristics, production performance, reproductive traits, and growth performance of Toda buffaloes, scientific information on mortality patterns and associated risk factors under traditional tribal management remains limited. Karthikeyan *et al.* (2002) [5] reported the production and reproductive performance of Toda buffaloes under traditional management and highlighted the breed's adaptability to the harsh environmental conditions of the Nilgiris. More recently, Selvamani *et al.* (2026b) [10] evaluated the pre-weaning growth performance of Toda buffalo calves and demonstrated satisfactory growth under tribal production systems, while

emphasizing the need for improved calf management to enhance productivity and conservation. However, systematic epidemiological studies investigating the influence of season, age, sex, and disease conditions on calf mortality are scarce. Understanding the epidemiology of calf mortality is essential for identifying critical risk factors, developing preventive health strategies, and strengthening conservation programmes for this endangered breed. Information on mortality patterns will assist veterinarians, researchers, and policymakers in designing evidence-based interventions aimed at improving calf survival and enhancing the long-term sustainability of the Toda buffalo population.

2. Materials and Methods

2.1 Study Area

The present study was conducted in the Nilgiris district of Tamil Nadu, India, situated in the Western Ghats between 11°10'-11°45' N latitude and 76°14'-77°02' E longitude. The district lies at an altitude ranging from 900 to 2,636 m above mean sea level and is characterized by a subtropical highland climate with cool temperatures (5-25°C), high relative humidity, and annual rainfall ranging from 1,200 to 2,500 mm. The region comprises extensive montane grasslands interspersed with shola forests, providing the natural habitat for the indigenous Toda buffalo. The study covered all major Toda settlements (Munds) distributed throughout the Nilgiris district where buffaloes are traditionally maintained under extensive grazing conditions.

2.2 Study Population

The study population comprised Toda buffalo calves (*Bubalus bubalis*) reared by the Toda tribal community under the traditional pastoral production system. Buffaloes were maintained under free-range grazing on natural grasslands and forest margins with minimal external inputs. Calves remained with their dams and were allowed to suckle naturally. No intensive feeding or commercial dairy management practices were followed.

2.3 Study Design

A longitudinal observational study was conducted over a period of three years (2023-2026) to investigate the mortality pattern and associated risk factors in Toda buffalo calves. A complete population enumeration (census method) was adopted to include all reported calf mortality cases occurring in the Toda buffalo population during the study period.

2.4 Data Collection

Data were collected through regular field visits to Toda settlements, personal interviews with buffalo owners using a pre-tested structured questionnaire, direct field observations, and veterinary health records.

For each mortality case, the following information was recorded:

Identification of calf, Date of birth, Sex (male or female), Age at death, Date of death, Season of occurrence, Clinical signs before death, Probable cause of death, Feeding and suckling practices, Grazing management, Housing conditions, Treatment history and Veterinary diagnosis and post-mortem findings, wherever available.

The probable cause of death was determined based on clinical history, field observations, veterinary examination, available treatment records, and information provided by livestock owners.

2.5 Statistical Analysis

All data were analysed using IBM SPSS Statistics Version 29.0. Descriptive statistics were used to summarize calf mortality according to season, age, sex, and cause of death. Results were expressed as frequencies and percentages. The association between calf mortality and different risk factors was evaluated using the Pearson Chi-square (χ^2) test of association. The null hypothesis assumed that calf mortality was equally distributed among the different categories of each variable.

The chi-square statistic was calculated using the formula:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Where:

* O = Observed frequency

* E = Expected frequency

Statistical significance was declared at:

* $p < 0.05$ - Significant

* $p < 0.01$ - Highly significant

3. Results and Discussion

3.1 Overall mortality pattern

During the three-year study period (2023-2026), a total of 240 Toda buffalo calf mortality cases were recorded under the traditional tribal production system in the Nilgiris district. Mortality was analysed according to season, age, sex and probable cause of death. Pearson's Chi-square analysis demonstrated that season, age, cause of death and sex were significantly associated with calf mortality, indicating that these factors play an important role in determining calf survival under the prevailing management conditions. The findings indicate that calf mortality in Toda buffaloes is multifactorial and results from the interaction between environmental stress, traditional management practices and disease occurrence. Similar observations have been reported in buffalo production systems by Constable *et al.* (2017) [2] and Cho and Yoon (2014) [1], who emphasized that management, climate and enteric diseases, are the principal

determinants of neonatal calf survival. The production performance reported by Selvamani *et al.* (2026a) [9] demonstrates that Toda buffaloes possess satisfactory productive potential under traditional management. However, the present investigation indicates that calf mortality remains a major limitation to realizing this potential, as herd replacement is directly affected by losses during the neonatal period.

3.2 Seasonal variation in calf mortality

Season showed the strongest association with calf mortality ($\chi^2 = 108.18$; $p < 0.001$) (Table 1 and 2). Among the 240 mortality cases, 149 (62.10%) occurred during the rainy season, followed by 73 (30.40%) during winter and only 18 (7.50%) during summer. Similar highly significant associations were observed during each individual year of the study, indicating that seasonal variation consistently influenced calf mortality.

Table 1: Association between calf mortality and season in Toda buffalo calves

Season	No. of Calves Died	Percentage (%)	χ^2 value	df	p-value
Rainy	149	(62.1)	108.18**	2	<0.001
Winter	73	(30.4)			
Summer	18	(7.5)			
Total	240	(100.0)			

**Significant at $p < 0.01$

The predominance of mortality during the rainy season can be attributed to the unique climatic conditions prevailing in the Nilgiris. Heavy rainfall, prolonged cold weather, high humidity and muddy grazing areas favour the multiplication and transmission of enteric pathogens while simultaneously reducing the immune competence of neonatal calves. Buffalo calves exposed to continuous wet and cold environments are more susceptible to hypothermia, diarrhoea and secondary bacterial infections. Since Toda buffaloes are maintained under extensive grazing throughout the year (Selvamani *et al.*, 2026a) [9], calves are continuously exposed to adverse climatic conditions during the rainy season, increasing their susceptibility to enteric diseases and hypothermia.

Table 2: Year-wise consistency of association between calf mortality and season

Year	Rainy n (%)	Winter n (%)	Summer n (%)	Total	χ^2 value	df	p-value
2023-24	40 (59.7)	22 (32.8)	5 (7.5)	67	27.43**	2	<0.001
2024-25	57 (62.0)	26 (28.3)	9 (9.8)	92	38.63**	2	<0.001
2025-26	52 (64.2)	25 (30.9)	4 (4.9)	81	42.89**	2	<0.001

**Significant at $p < 0.01$

The present findings agree with Cho and Yoon (2014) [1], who reported that calf diarrhoea is more prevalent during periods of increased environmental contamination associated with rainy weather. Likewise, Constable *et al.* (2017) [2] described cold stress and poor environmental hygiene as major risk factors predisposing neonatal calves to diarrhoeal diseases and mortality. Similar observations have also been reported by Windeyer *et al.* (2014) [12], who concluded that adverse climatic conditions significantly increase calf morbidity and mortality.

The traditional management system practiced by the Toda tribe further aggravates this situation because buffaloes graze throughout the day in open grasslands and shola forests, exposing calves to prolonged cold, rain and fluctuating environmental conditions.

3.3 Age-wise mortality pattern

Age had a highly significant influence on calf mortality ($\chi^2 = 50.93$; $P < 0.001$) (Table 3 and 4). The highest mortality occurred among calves aged 1-3 months (51.25%), followed by 3-6 months (35.00%), while only 13.75% of deaths occurred after six months of age.

Table 3: Association between calf mortality and age at death in Toda buffalo calves

Age Group	No. of Calves Died	Percentage (%)	χ^2 value	df	p-value
1-3 months	123	(51.25)	50.93**	2	<0.001
3-6 months	84	(35.00)			
>6 months	33	(13.75)			
Total	240	(100.0)			

**Significant at $p < 0.01$

These findings clearly demonstrate that the neonatal and early pre-weaning periods constitute the most critical stages for calf survival. During early life, calves depend primarily on passive immunity acquired through colostrum, which gradually declines before the development of an effective active immune response. Consequently, young calves remain highly susceptible to infectious diseases, digestive disorders and environmental stress.

Table 4: Year-wise consistency of association between calf mortality and age at death (2023-2026)

Year	1-3 months (%)	3-6 months (%)	>6 months (%)	Total	χ^2 value	df	p-value
2023-24	34 (50.7)	24 (35.8)	9 (13.4)	67	14.18**	2	<0.001
2024-25	47 (51.1)	32 (34.8)	13 (14.1)	92	18.94**	2	<0.001
2025-26	42 (51.9)	28 (34.6)	11 (13.6)	81	17.85**	2	<0.001

**Significant at $p < 0.01$.

The present observations corroborate the findings of Radostits

Table 5: Association between calf mortality and cause of death in Toda buffalo calves

Cause of Death	No. of Calves Died	Percentage (%)	χ^2 value	df	p-value
Calf scour	117	(48.75)	27.93**	2	<0.001
Enteritis	71	(29.58)			
Unrevealed/Sudden death	52	(21.67)			
Total	240	(100.0)			

**Significant at $p < 0.01$

Calf scour remains the most important disease affecting neonatal buffalo calves because severe dehydration, electrolyte imbalance and metabolic acidosis rapidly lead to death if treatment is delayed. According to Cho and Yoon (2014) [1], neonatal diarrhoea is a multifactorial disease involving bacterial, viral, protozoal and nutritional causes. Constable *et al.* (2017) [2] also reported that diarrhoea is responsible for the greatest proportion of calf mortality worldwide. Field observations during the present investigation indicated that Toda buffaloes are generally not milked, allowing milk to accumulate in the udder while animals graze throughout the day. Hungry calves consume excessive quantities of milk after the dams return from grazing, which may predispose them to digestive disturbances, lactose overload and nutritional diarrhoea. The

et al. (2007) [7], who reported that more than half of calf deaths generally occur within the first three months of life. Similarly, Constable *et al.* (2017) [2] stated that inadequate passive transfer of immunity, poor nutrition and enteric infections account for the majority of neonatal mortality. Recently, Selvamani *et al.* (2026b) [10] reported satisfactory pre-weaning growth performance in Toda buffalo calves under tribal conditions but emphasised that improved neonatal management is essential for maximizing calf survival. Therefore, special management during the first three months of life is critical for reducing mortality and improving conservation of this endangered breed.

3.4 Cause-wise mortality pattern

Cause of death was also significantly associated with calf mortality ($\chi^2 = 27.93$; $p < 0.001$) (Table 5 and 6). Calf scour accounted for nearly half (48.75%) of all mortality, followed by enteritis (29.58%), whereas 21.67% of deaths remained unrevealed or were categorized as sudden deaths.

traditional suckling management system described by Selvamani *et al.* (2026a) [9] may indirectly contribute to digestive disturbances in young calves, particularly when calves consume excessive quantities of accumulated milk after prolonged grazing of their dams.

Furthermore, many livestock owners interpreted thread-like curdled milk particles in diarrhoeic faeces as intestinal worms and administered anthelmintic drugs instead of oral rehydration therapy and appropriate veterinary treatment. Such misconceptions frequently delayed effective treatment and increased calf mortality. The unidentified mortality cases were probably associated with sudden deaths resulting from severe cold stress, undiagnosed infections or the absence of laboratory diagnosis under field conditions.

Table 6: Year-wise consistency of association between calf mortality and cause of death (2023-2026)

Year	Calf Scour n (%)	Enteritis n (%)	Unrevealed n (%)	Total	χ^2 value	df	p-value
2023-24	33 (49.3)	24 (35.8)	10 (14.9)	67	12.03**	2	0.002
2024-25	39 (42.4)	28 (30.4)	25 (27.2)	92	3.54 NS	2	0.170
2025-26	45 (55.6)	19 (23.5)	17 (21.0)	81	18.07**	2	<0.001

**Significant at $p < 0.01$; NS = Not Significant ($p > 0.05$)

3.5 Sex-wise mortality pattern

Sex had a statistically significant effect on calf mortality ($\chi^2 = 4.27$; $p = 0.039$) (Table 7). Male calves accounted for 56.70% of the mortality cases, whereas female calves represented 43.30%.

Table 7: Association between calf mortality and sex in Toda buffalo calves

Sex	No. of Calves Died	Percentage (%)	χ^2 value	df	p-value
Male	136	(56.7)			
Female	104	(43.3)			
Total	240	(100.0)	4.27*	1	0.039

*Significant at $p < 0.05$

Higher mortality among male calves has been reported in several livestock species and may be attributed to their relatively higher birth weight, greater nutritional requirements and increased susceptibility to environmental stress during early growth. Selvamani *et al.* (2026b) [10] observed significantly higher body weights in male Toda buffalo calves throughout the pre-weaning period, indicating greater growth potential. However, higher metabolic demands may also increase vulnerability when nutritional supply or health management is inadequate. Similar findings were reported by Windeyer *et al.* (2014) [12], who identified male sex as an independent risk factor for increased calf mortality in dairy production systems.

4. Conclusion

The present study provides comprehensive information on the mortality pattern and associated risk factors affecting Toda buffalo (*Bubalus bubalis*) calves reared under the traditional tribal management system of the Nilgiris district, Tamil Nadu. Analysis of 240 calf mortality cases recorded during the period 2023-2026 demonstrated that calf mortality was significantly associated with season, age, cause of death, and sex, indicating that these factors play a crucial role in determining calf survival under the traditional production system. Among the evaluated risk factors, season emerged as the most influential determinant, with the highest mortality occurring during the rainy season, followed by winter and summer. The increased mortality during the rainy season is likely attributable to prolonged rainfall, cold stress, high humidity, and increased exposure to enteric pathogens under extensive grazing conditions. Similarly, age had a significant influence on mortality, with more than half of the deaths occurring during the first three months of life, confirming that the neonatal and early pre-weaning periods are the most critical stages for calf survival. Disease-wise analysis identified calf scours as the leading cause of mortality, followed by enteritis, highlighting gastrointestinal disorders as the principal health challenge in Toda buffalo calves. Field observations indicated that unrestricted suckling after prolonged grazing, excessive milk intake, delayed recognition of diarrhoeal diseases, and misconceptions regarding the treatment of calf diarrhoea contribute substantially to calf losses. The significantly higher mortality observed among male calves further suggests that biological differences together with management-related factors may influence calf survival.

The findings emphasise that traditional management practices, environmental conditions, and inadequate awareness regarding neonatal calf health collectively contribute to the observed mortality pattern. Strengthening neonatal calf management through timely colostrum feeding, controlled suckling practices, provision of clean and dry calf shelters during adverse weather, early diagnosis and treatment of diarrhoeal diseases, strategic vaccination and deworming, and regular veterinary health monitoring could substantially reduce calf mortality. Furthermore, community-based extension programmes and farmer training focusing on scientific calf management should be integrated into ongoing conservation initiatives for the Toda tribe. The Toda buffalo is an endangered indigenous breed possessing unique genetic, ecological, and cultural importance. Therefore, improving calf survival is fundamental for increasing herd replacement, conserving valuable genetic resources, and ensuring the long-term sustainability of the breed. The epidemiological information generated from the present investigation provides a valuable scientific foundation for veterinarians, researchers, conservation agencies, and policymakers to formulate evidence-based health management and conservation strategies.

Future research should focus on laboratory confirmation of infectious agents responsible for calf diarrhoea, molecular epidemiology of neonatal diseases, evaluation of colostrum management practices, nutritional interventions, and long-term health surveillance of Toda buffalo populations. Such studies will contribute to the development of effective disease prevention programmes and further strengthen the in situ conservation of the endangered Toda buffalo under its traditional tribal production system.

5. Conflict of Interest

Not available.

6. Financial Support

Not available.

References

1. Cho YI, Yoon KJ. An overview of calf diarrhea: Infectious etiology, diagnosis, and intervention. *J Vet Sci*. 2014;15(1):1-17.
2. Constable PD, Hinchcliff KW, Done SH, Grünberg W. *Veterinary medicine: A textbook of the diseases of cattle, horses, sheep, pigs and goats*. 11th ed. St. Louis: Elsevier; 2017.
3. Food and Agriculture Organization. *The state of food and agriculture 2023*. Rome: Food and Agriculture Organization of the United Nations; 2023.
4. ICAR-National Bureau of Animal Genetic Resources. *Registered indigenous buffalo breeds of India*. Karnal: ICAR-NBAGR; 2023.
5. Karthikeyan MK, Iyue M, Kandasamy N, Panneerselvam S. Characteristics and performance of Toda buffaloes of the Nilgiris, India: II. Production and reproduction performance. *Buff J*. 2002;18(3):311-320.
6. Nivsarkar AE, Vij PK, Tania MS. *Animal genetic resources of India: Cattle and buffalo*. Karnal: National Bureau of Animal Genetic Resources; 2000.
7. Radostits OM, Gay CC, Hinchcliff KW, Constable PD. *Veterinary medicine: A textbook of the diseases of cattle, horses, sheep, pigs and goats*. 10th ed. Philadelphia: Saunders Elsevier; 2007.
8. Rivers WHR. *The Todas*. London: Macmillan & Co.; 1906.
9. Selvamani J, Pillai HB, Boopathy Raja M, Karu P. A longitudinal study on the production and reproductive performance of the Toda buffalo under traditional management in the Nilgiris. *Int J Vet Sci Anim Husb*. 2026;11(7):186-190.
10. Selvamani J, Boopathy Raja M, Prema N, Karu P. Pre-weaning growth performance of Toda buffalo calves under tribal conditions in the Nilgiris, Tamil Nadu. *Indian J Anim Res*. 2026.
11. Walker A. *The Toda of South India: A new look*. Delhi: Hindustan Publishing Corporation; 1986.
12. Windeyer MC, Leslie KE, Godden SM, Hodgins DC, Lissemore KD, LeBlanc SJ. Factors associated with morbidity, mortality, and growth of dairy heifer calves. *J Dairy Sci*. 2014;97(5):3076-3087.

How to Cite This Article

Selvamani J, Raja SS, Pillai HB, Raja MB, Karu P. Mortality pattern and associated risk factors in Toda buffalo calves under tribal management in the Nilgiris district of Tamil Nadu, India. *International Journal of Veterinary Sciences and Animal Husbandry*. 2026;SP-11(8):96-100.

Creative Commons (CC) License

This is an open-access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.