



International Journal of Veterinary Sciences and Animal Husbandry



ISSN: 2456-2912

NAAS Rating (2026): 4.61

VET 2025; SP-11(5): 54-57

© 2026 VET

www.veterinarypaper.com

Received: 22-03-2026

Accepted: 28-04-2026

R Sakthivadivu

Assistant Professor, Livestock
Farm Complex, Veterinary
College and Research Institute,
Namakkal, Tamil Nadu
Veterinary and Animal Sciences
University, Chennai, Tamil Nadu

N Bharathy

Associate Professor, Livestock
Production Management,
Veterinary College and Research
Institute, Salem, Tamil Nadu
Veterinary and Animal Sciences
University, Chennai, Tamil Nadu

PC Sakthivel

Associate Professor, Department
of Animal Nutrition, Veterinary
College and Research Institute,
Orathanadu, Tamil Nadu
Veterinary and Animal Sciences
University, Chennai, Tamil Nadu

S Ramakrishnan

Professor, Livestock Farm
Complex, Veterinary College and
Research Institute, Namakkal,
Tamil Nadu Veterinary and
Animal Sciences University,
Chennai, Tamil Nadu

P Thirunavukkarasu

Assistant Professor, Livestock
Farm Complex, Veterinary
College and Research Institute,
Namakkal, Tamil Nadu
Veterinary and Animal Sciences
University, Chennai, Tamil Nadu

Corresponding Author:

R Sakthivadivu

Assistant Professor, Livestock
Farm Complex, Veterinary
College and Research Institute,
Namakkal, Tamil Nadu
Veterinary and Animal Sciences
University, Chennai, Tamil Nadu

Influence of non-genetic factors on birth weight of Mecheri sheep maintained at an organized farm

R Sakthivadivu, N Bharathy, PC Sakthivel, S Ramakrishnan and P
Thirunavukkarasu

DOI: <https://www.doi.org/10.22271/veterinary.2026.v11.i5Sa.3267>

Abstract

A study was conducted to evaluate the influence of non-genetic factors on the birth weight of Mecheri sheep maintained at the Veterinary College and Research Institute from 2014 to 2024. Data collected from 643 lambs were analyzed using least squares means and standard error methods. The overall mean birth weight was recorded as 2.483 ± 0.017 kg. Season of birth had a highly significant ($P < 0.01$) effect on birth weight, with lambs born during the Southwest Monsoon season showing the highest birth weight (2.616 ± 0.038 kg), whereas summer-born lambs had the lowest (2.368 ± 0.036 kg). Sex of lamb did not significantly influence birth weight, although male lambs (2.496 ± 0.024 kg) were slightly heavier than females (2.461 ± 0.025 kg). Type of birth also affected birth weight, with single-born lambs (2.480 ± 0.018 kg) being heavier than twins (2.451 ± 0.080 kg). The findings emphasize the role of environmental and physiological factors in prenatal growth of Mecheri sheep.

Keywords: Birth weight, season, type of birth, Sex of birth

1. Introduction

Sheep production plays a vital role in sustaining the livelihoods of rural farmers in India, particularly in arid and semi-arid regions where crop production is often uncertain. Among the various indigenous breeds, the Mecheri sheep of Tamil Nadu is highly valued for its excellent adaptability to harsh climatic conditions, disease resistance and superior carcass quality, making it one of the most important mutton breeds in South India (Thiruvankadan *et al.*, 2008)^[16]. In sheep production systems, birth weight is considered a key economic trait because it has a strong positive association with lamb survival, pre-weaning growth rate and overall flock productivity (Juengel *et al.*, 2018)^[9]. Lambs with optimal birth weight are more likely to survive early life stress and achieve better growth performance.

Birth weight is a multifactorial trait influenced by both genetic and non-genetic factors. While genetic makeup determines the inherent growth potential of the lamb, non-genetic factors significantly modulate the expression of this trait. Among these, season of birth, sex of the lamb, and type of birth (single or multiple) are particularly important. Seasonal variations influence the availability and quality of feed resources, ambient temperature, and the physiological status of the dam during gestation. For instance, lambs born during favorable seasons with abundant nutrition tend to have higher birth weights compared to those born during periods of feed scarcity (Heinzen *et al.*, 2023)^[8].

In addition, sex-related differences in endocrine profiles contribute to variation in birth weight, with male lambs generally being heavier than female lambs due to anabolic effects of androgens. The type of birth also plays a significant role; single-born lambs typically have higher birth weights than twins or triplets because of reduced intrauterine competition for nutrients. Maternal factors such as age, parity, body condition and health status further influence fetal growth and development. Understanding the combined effects of these factors is essential for designing effective breeding and management strategies aimed at improving lamb survival and productivity in Mecheri sheep under field conditions.

Materials and Methods

Study area

The investigation was carried out at the Livestock Farm Complex, Veterinary College and Research Institute, Namakkal, Tamil Nadu, which falls under the north-western agro-climatic zone characterized by tropical climate conditions.

Data Collection

A total of 643 lambing records of Mecheri sheep maintained under uniform management practices were utilized for the study. Standard feeding, breeding and health care practices were followed throughout the study period.

Classification of Data

The data were classified as follows:

Season of birth

- Summer (March–May)
- Southwest Monsoon (June–September)
- Northeast Monsoon (October–December)
- Winter (January–February)

Sex

- Male and Female

Type of birth

- Single and Twins

Statistical Analysis

The data were analyzed using least squares analysis as described by Snedecor and Cochran (1996) ^[15] using SPSS software package.

Results and Discussion

Effect of Season on Birth Weight

Table 1: Mean $\pm$ SE of season affect the birth weight of Mecheri sheep

Season	Number of observation	Mean $\pm$ SE
Summer	140	2.368 $\pm$ 0.036 ^c
SWM	128	2.616 $\pm$ 0.038 ^a
NEM	168	2.476 $\pm$ 0.033 ^b
Winter	207	2.471 $\pm$ 0.030 ^b
Overall	643	2.483 $\pm$ 0.017

Season of birth exerted a highly significant ($P < 0.01$) influence on the birth weight of Mecheri lambs. Among the different seasons, lambs born during the Southwest Monsoon (SWM) recorded the highest mean birth weight (2.616 kg), while those born in summer had the lowest (2.368 kg). Lambs born during Northeast Monsoon (NEM) and winter seasons showed intermediate values and did not differ significantly from each other.

The higher birth weight observed during the SWM season can be primarily attributed to improved availability of green fodder and better nutritional status of pregnant ewes during gestation. In rainfed production systems typical of Tamil Nadu, the monsoon period supports abundant pasture growth, which enhances both the quantity and quality of feed intake. Adequate maternal nutrition, especially during late gestation, is critical for optimal placental development and efficient nutrient transfer to the fetus, thereby promoting higher birth weight. This is consistent with findings that maternal plane of nutrition directly affects fetal growth and lamb viability.

In contrast, the significantly lower birth weight recorded in summer born lambs may be due to adverse environmental conditions such as high ambient temperature, water scarcity and reduced pasture availability. Heat stress during pregnancy negatively affects feed intake, metabolic efficiency and endocrine balance in ewes, leading to restricted fetal growth. Prolonged exposure to thermal stress can also impair placental function, further contributing to reduced birth weight.

The intermediate birth weights observed during NEM and winter seasons suggest moderate environmental conditions and relatively stable feed resources compared to summer. Although fodder availability improves during NEM, excessive rainfall and associated management challenges may slightly limit nutrient utilization. Winter conditions, while thermally comfortable, may still experience variability in feed supply depending on local agro-climatic conditions.

The present findings are in strong agreement with earlier reports in Mecheri sheep by Thiruvengadan *et al.* (2008) ^[16], who also documented significant seasonal variation in birth weight, with monsoon-born lambs outperforming those born in summer. Similar trends have been reported in other Indian sheep breeds. Dhakad *et al.* (2023) ^[6] observed higher birth weights in lambs born during seasons with better feed availability in Malpura sheep. Likewise, Karmakar *et al.* (2018) ^[10] reported significant seasonal effects on growth traits in Garole sheep, emphasizing the role of environmental conditions during gestation.

Furthermore, Gowane *et al.* (2015) ^[7] highlighted that non-genetic factors, particularly season, play a crucial role in determining early growth traits due to their influence on maternal nutrition and physiological status. Reports by Sharma *et al.* (1999) ^[14] and Albial *et al.* (2014) ^[1] also support the conclusion that favorable climatic conditions coupled with adequate nutrition during pregnancy lead to improved birth weight in lambs.

Overall, the results clearly indicate that season is a major non-genetic factor influencing birth weight in Mecheri sheep. Strategic breeding programs aimed at synchronizing lambing with favorable seasons, along with improved nutritional management during critical stages of gestation, can significantly enhance lamb birth weight and subsequent productivity.

Effect of Sex on Birth Weight

Table 2: Mean $\pm$ SE of Sex affect the birth weight of Mecheri sheep

Sex	Number of observation	Mean $\pm$ SE
Male	324	2.496 $\pm$ 0.024
Female	319	2.461 $\pm$ 0.025

The effect of sex on birth weight of Mecheri lambs was found to be non-significant. However, male lambs recorded a slightly higher mean birth weight (2.496 kg) compared to female lambs (2.461 kg). Although the difference was marginal, the trend consistently favored male lambs.

The relatively higher birth weight observed in male lambs may be attributed to inherent physiological and hormonal differences between the sexes. Male fetuses are generally influenced by androgens, which exert anabolic effects that enhance protein synthesis, muscle development and overall fetal growth. These hormonal influences result in slightly higher growth rates and improved nutrient utilization efficiency in male lambs during the prenatal stage.

Another possible explanation for this difference is the variation in placental efficiency and metabolic activity

between male and female fetuses. Studies suggest that male fetuses often exhibit more aggressive growth patterns, which can lead to higher nutrient demand and consequently greater birth weight under favorable maternal conditions. However, when maternal nutrition is limited, this advantage may diminish, explaining the non-significant statistical difference observed in the present study.

The non-significant effect of sex indicates that, under the prevailing management and environmental conditions, sex alone does not contribute substantially to variation in birth weight in Mecheri sheep. This suggests that other non-genetic factors such as season of birth, type of birth, and maternal nutrition play a more dominant role in determining birth weight.

The present findings are in close agreement with earlier studies. Mandal *et al.* (2003) [12] reported higher birth weights in male lambs of Muzaffarnagari sheep, although the differences were not statistically significant. Taskin *et al.* (2012) [18] also reported comparable results in Sonmez lambs, emphasizing that sex has a relatively minor influence on birth weight compared to environmental and management factors. In contrast, Behzadi *et al.* (2007) [2] observed that in Kermani sheep, male lambs had higher birth weights than female lambs, and this difference was statistically significant.

Further support is provided by Gowane *et al.* (2015) [7], who indicated that while sex-related differences exist, their impact is often overshadowed by factors such as season and nutrition. Overall, the results indicate that although male lambs tend to be slightly heavier at birth, the effect of sex is relatively small and non-significant in Mecheri sheep. Therefore, improvement in birth weight should primarily focus on optimizing environmental and maternal factors rather than sex-based selection.

Effect of Type of Birth on Birth Weight

Table 3: Mean $\pm$ SE of birth weight affect the type of birth of Mecheri sheep

Sex	Number of observation	Mean $\pm$ SE
Single	613	2.480 $\pm$ 0.018
Twins	30	2.451 $\pm$ 0.080

The analysis of birth weight in Mecheri sheep revealed that type of birth had a numerically significant effect on lamb birth weight. Single-born lambs (2.480 $\pm$ 0.018 kg) were heavier than twin-born lambs (2.451 $\pm$ 0.080 kg). Although the numerical difference appears small, it is biologically meaningful, as birth weight is a key determinant of neonatal survival, early growth, and overall productivity in sheep.

The relatively higher birth weight of single lambs can be explained by the absence of intrauterine competition. In single pregnancies, the fetus has exclusive access to maternal nutrients and uterine space, allowing optimal growth and development. In contrast, twin pregnancies involve sharing of nutrients and space between fetuses, leading to restricted individual growth. This intrauterine competition reduces nutrient availability per fetus and limits placental development and efficiency, ultimately resulting in lower birth weights. Reduced placental surface area per fetus in multiple pregnancies further constrains nutrient transfer, which has been widely recognized as a major physiological limitation in twin-bearing ewes.

The present findings are consistent with earlier reports. Dagdelen (2026) [4] observed significantly higher birth weights in single lambs compared to twins, attributing the

difference to uterine resource allocation. Similarly, Khan *et al.* (2023) [11] reported that type of birth was a major non-genetic factor influencing birth weight, with twin lambs exhibiting reduced weights due to limited intrauterine resources. Washaya *et al.* (2023) [19] also emphasized that type of birth significantly affects early growth traits and should be considered in breeding and management programs.

Further support comes from studies by Dixit *et al.* (2001) [5] and McHugh *et al.*, (2017) [13] who reported similar trends across different sheep breeds, confirming that single-born lambs consistently outperform twins in terms of birth weight. In addition, Boujenane *et al.* (2015) [3] highlighted that litter size is one of the most influential environmental factors affecting prenatal growth.

The higher standard error observed in twin-born lambs ($\pm$ 0.080) compared to singles ($\pm$ 0.018) in the present study indicates greater variability in birth weight among twins. This could be due to the smaller sample size (N = 30) and variation in factors such as maternal nutrition, parity and uterine capacity. Differences in placental attachment and unequal nutrient distribution between twin fetuses may also contribute to this variability.

Overall, the results clearly demonstrate that type of birth is a critical factor influencing birth weight in Mecheri sheep. The lower birth weight of twin lambs suggests the need for improved nutritional and management strategies for pregnant ewes carrying multiple fetuses to minimize intrauterine growth restriction and enhance lamb viability and performance.

Conclusion

The results clearly indicate that season is the most influential non-genetic factor affecting birth weight, followed by type of birth, while sex has minimal influence. The strong seasonal effect highlights the importance of maternal nutrition and environmental conditions during gestation, which directly impact fetal growth and development.

The findings suggest that strategic breeding programs should be planned to align late gestation with favorable seasons, particularly the monsoon period, to maximize birth weight. Additionally, special nutritional care should be provided to ewes carrying twin fetuses to minimize the negative impact of intrauterine competition.

Acknowledgement

The authors thank the Dean and Professor and Head, Livestock Farm Complex, Veterinary College and Research Institute, Namakkal, for providing facilities and data for this study.

Ethics declarations

Not applicable

Conflicts of interest

No conflict of interest

Financial Support

Not available

References

1. Albial AM, Singh J, Singh DP, Niwas R. Environmental influences on growth traits of Nali sheep. *Indian J Anim Res.* 2014;48(1):75-77.
2. Behzadi MRB, Shahroudi FE, Van Vleck LD. Estimates of genetic parameters for growth traits in Kermani sheep.

- J Anim Breed Genet. 2007;124(5):296-301.
3. Boujenane I, Chikhi A, Ibelbachyr M, Mouh FZ. Estimation of genetic parameters and maternal effects for body weight at different ages in D'man sheep. *Small Rumin Res.* 2015;130:27-35.
 4. Dagdelen U. Genetic variation in the growth hormone (GH) gene influences postnatal growth and placental structure in indigenous Tuj sheep. *Arch Anim Breed.* 2026;69:89-99.
 5. Dixit SP, Dhillon JS, Singh G. Genetic and non-genetic parameter estimates for growth traits of Bharat Merino sheep. *Small Rumin Res.* 2001;42(2):101-104.
 6. Dhakad GS, Saini S, Mallic PK, Sharma PC, Singh N, Misra SS. Effect of non-genetic factors on body weights in Malpura sheep. *Indian J Small Rumin.* 2023;29(2):205-208.
 7. Gowane GR, Prince LLL, Lopes FB, Paswan C, Sharma RC. Genetic and phenotypic parameter estimates of live weight and daily gain traits in Malpura sheep using Bayesian approach. *Small Rumin Res.* 2015;128:10-18.
 8. Heinzen BC, Weber SH, Maia D, Sotomaior CS. Productive performance of lambs born in different seasons of the year. *Open Vet J.* 2023;13(7):932-941.
 9. Juengel JL, Davis GH, Wheeler R, Dodds KG, Johnstone PD. Factors affecting differences between birth weight of littermates (BWTD) and the effects of BWTD on lamb performance. *Anim Reprod Sci.* 2018;191:34-43.
 10. Karmakar PK, Sarkar M, Raha C, Mandal A. Genetic parameter for direct and maternal effects on birth weight of Garole sheep. *Indian J Small Rumin.* 2018;24(2):225-229.
 11. Khan M, Faraz A, Farooq A, Waheed A, Parveen R, Tauqir NA, *et al.* Non-genetic factors affecting birth weight in Thalli sheep. *J Agric Food.* 2023;4(1):29-35.
 12. Mandal A, Pant KP, Nandy DK, Rout PK, Roy R. Genetic analysis of growth traits in Muzaffarnagari sheep. *Trop Anim Health Prod.* 2003;35:271-284.
 13. McHugh N, Pabiou T, McDermott K, Wall E, Berry DP. Impact of birth and rearing type, as well as inaccuracy of recording, on pre-weaning lamb phenotypic and genetic merit for live weight. *Transl Anim Sci.* 2017;1(2):137-145.
 14. Sharma RC, Arora AL, Kumar R, Narula HK. Impact of genetic and non-genetic factors on growth profile in Malpura and Avikalin lambs. *Indian J Anim Sci.* 1999;69(10):820-822.
 15. Snedecor GW, Cochran WG. *Statistical methods.* 8th ed. Ames (IA): Iowa State University Press; 1996.
 16. Thiruvankadan AK, Chinnamani K, Muralidharan J, Karunanithi K. Effect of non-genetic factors on birth weight of Mecheri sheep of India. *Livest Res Rural Dev.* 2008;20(6):1-4.
 17. Thiruvankadan AK, Karunanithi K, Murugan M, Arunachalam K, Narendra Babu R. A comparative study on growth performance of crossbred and purebred Mecheri sheep raised under dry land farming conditions. *S Afr J Anim Sci.* 2009;39(suppl 1):121-125.
 18. Taskin T, Kaymakci M, Sönmez R, Yılmaz M, Bardakcioglu HE. Genetic and non-genetic parameter estimates for growth traits of Sönmez lambs. *Vet Med Zoot.* 2012;60(82):79-83.
 19. Washaya S, Ngorio U, Mudzengi CP. Effects of breeding season, birth type and sex on growth and reproductive performances of sheep breeds. *Trop Anim Health Prod.* 2023;55(3):188-198.

How to Cite This Article

Sakthivadivu R, Bharathy N, Sakthivel PC, Ramakrishnan S, Thirunavukkarasu P. Influence of non-genetic factors on birth weight of Mecheri sheep maintained at an organized farm. *International Journal of Veterinary Sciences and Animal Husbandry.* 2026;SP-11(5):54-57.

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.