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Peripartum and postpartum reproductive and neonatal traits of Kangayam cattle of Tamil Nadu, India

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Kangayam cattle, often regarded as the pride of Tamil Nadu, are a well-known indigenous draught breed. Kangayam calves are typically born red, with coat colour changing as they mature (Usha and Mahesh 2025). This breed is highly valued for its superior draught ability, disease resistance, adaptability to poor nutrition, tolerance to drought conditions, and longevity. In addition to agricultural operations and hauling, Kangayam cattle are also traditionally used in rural sports such as Jallikattu (Bullfight sport) and Rekla races (Bullock cart racing sport). Furthermore, the breed exhibits a low body mass index, reduced metabolic rate, minimal water requirement, and a strong ability to withstand heat, humidity, and environmental stress, indicating high resilience (Kavithaa *et al.* 2021). Despite these valuable traits, the population of Kangayam cattle has shown a declining trend. Reproductive performance, particularly pregnancy and calving, plays a crucial role in herd sustainability and milk production. However, there is a lack of standardized data on parturient and neonatal parameters in Kangayam cows. Therefore, the present study was undertaken to standardize key parturient, postpartum, and neonatal characteristics of this indigenous breed.

The study was carried out at the Kangayam Cattle Research Station, which is situated at 11.5048° N latitude, 77.2384° E longitude in Baguthampalayam village of Sathyamangalam, Erode District of Tamil Nadu, a Southern state of India. The station is located in the north-western agro-climatic zone of Tamil Nadu, near the foothills of the Western Ghats, at ~250–300 meters above MSL. The region is categorized as a semi-arid to sub-tropical climate, with an average annual temperature ranging from about 22°C to 36°C. The agro-ecological conditions are dominated by dry land farming systems, red loamy to black soils, and sparse vegetation, providing a representative environment of the native breeding tract of Kangayam cattle. These climatic and environmental features make the station particularly suitable for research on heat tolerance, disease resistance, and adaptability of these indigenous cattle.

A total of 43 prepartum Kangayam cows and their subsequent parturitions were included in the study. These cows delivered total of 125 calves including 62 male and 63 female calves during the period from 2019 to 2026 and were analysed as individual records. All animals were maintained under a semi-intensive system and provided with balanced nutrition as per requirements. Routine health management practices, including periodic deworming and vaccination and systematic reproductive management with breeding records (breeding wheels) were maintained for each animal. The bulls maintained in the farm were allowed to mate the cows in estrus or artificial insemination was performed using tested good-quality semen, and pregnancy was confirmed between 60-70 days post-insemination. Close monitoring was undertaken in the pregnant cow shed during the last 2–3 weeks prior to the expected date of calving to observe parturition and related events. The parameters on peripartum and postpartum reproductive traits of Kangayam cows and neonatal traits of Kangayam calves in an organised structure are not clear so far. Hence, in the current study parameters, including the mean gestation length, duration of delivery following rupture of the water bag, time taken for expulsion of fetal membranes, weight of fetal membranes, postpartum body weight of the dam, birth weight of the calf, and neonatal behavioural parameters such as time taken to stand and to suckle colostrum have been recorded and analyzed.

In the present study, all 125 parturitions were completed

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Table 1. Gestation period in Kangayam cow

Parameters	Sex of the calf	
	Male	Female
Minimum Gestation length (days)	258	267
Maximum Gestation length (days)	309	307
Average gestation length (days)	291.54±4.43[a]	288.57±2.65[b]
Average of the total gestation length (days)	290.07±2.59	

[a,b] Different superscripts indicate the significant differences ($p<0.05$).

without any assistance or incidence of dystocia, indicating normal calving under the existing management conditions. The average gestation length recorded in Kangayam cows was 290.07 ± 2.59 days, which is relatively longer than that reported for several other indigenous and exotic breeds. Singh *et al.* (2012) observed a shorter mean gestation period of 279.86 ± 0.69 days in Gir cattle and Babu Rao (1990) reported a gestation length of 279.8 days in Ongole cattle, suggesting the presence of breed-specific differences. When analyzed based on the sex of the calf (Table 1), gestation length for male calves (291.54±4.43 days) was longer than that for female calves (288.57±2.65 days), with a statistically significant difference (t-test; P< 0.05). The increase of approximately 2.97 days in gestation for male calves suggested a clear influence of fetal sex on gestation duration. The observed longer gestation period for male calves was consistent with reports in crossbred and exotic cattle such as Holstein Friesian (Setyorini *et al.* 2023). However, some studies contradicted these observations. Arman (2011) in Hissar cattle and Prihandini (2017) in Madura cattle reported no significant effect of calf sex on gestation length. Similarly, Aprily *et al.* (2016) found no significant difference (P>0.05) between gestation lengths of male (277 days) and female calves (278 days) in dairy cattle.

In the present study, the mean duration of parturition in Kangayam cows was 54.43 ± 3.73 minutes, with a range of 30 to 210 minutes. These findings are broadly in agreement with earlier reports in indigenous cattle breeds, where the duration of the second stage of labor typically ranges between 30 and 120 minutes. Similar observations have been reported by Noakes (2009), who noted that normal calving in cows is usually completed within one hour, although slight variations may occur depending on parity, fetal size, and maternal factors. However, the maximum duration observed in the present investigation (210 minutes) was higher than the commonly reported range. Comparable extended durations have also been documented in some studies on native breeds, where environmental and genetic factors influence the progression of labor (Prakash et al. 2005). The relatively shorter mean duration observed in this study may suggest better adaptability and calving efficiency of Kangayam cows under the prevailing management conditions.

The duration of expulsion of fetal membranes observed in the present study was 181.70±5.69 minutes, with a range of 60 to 390 minutes, indicating that most animals completed the third stage of labour. According to classical reports, the fetal membranes in cattle are typically expelled within 2 to 12 hours postpartum, with most cows completing this process within 3- 8 hours (Noakes *et al*. 2019; Arthur *et al*. 2001; Roberts 1986). None of the animals in the present study exceeded the critical threshold of 12 hours, beyond which the condition is classified as retained fetal membranes. The comparatively shorter duration recorded may indicate efficient uterine contractions and prompt placental separation in Kangayam cows. This could be attributed to inherent breed characteristics or favourable management practices. Thus, the findings suggested that Kangayam cows possess a desirable reproductive trait in terms of timely expulsion of fetal membranes, aligning with normal physiological limits while tending toward the lower end of the reported range. In the present study, no case of placental retention was reported, and all animals expelled the fetal membranes naturally without requiring any assistance or intervention. This differed from earlier reports, where the incidence of retained fetal membranes has been documented to range from 5-15% under field conditions (Beagley *et al.* 2018). The absence of placental retention may, therefore, indicate better uterine health, breed adaptability of Kangayam cattle, or favorable management conditions.

The mean weight of fetal membranes recorded in Kangayam cows was 2.75±0.05 kg, with a range of 1.5 to 4.9 kg. These values were in agreement with recent findings that report placental weight variations associated with calf birth weight, maternal nutrition, and genetic factors (Zhao *et al.* 2017). The relatively low standard error indicated a high level of uniformity among Kangayam animals, possibly reflecting consistent management as well as genetic background. The mean weight of the fetal membranes in Kangayam cattle was approximately 13.15% of the calf birth weight. This value is slightly higher than those reported for *Bos taurus* breeds, where fetal membrane weight typically ranges between 10- 12% of calf birth weight (Noakes *et al.* 2019; Roberts, 1986), but it falls within the upper range documented for *Bos indicus* cattle (11–14%) (Hafez and Hafez 2000; Arthur *et al*. 2001). The relatively higher proportion observed may be attributed to breed-specific physiological adaptations, as indigenous zebu breeds are known for their resilience to tropical environments and may exhibit enhanced placental development to support fetal growth under variable nutritional and climatic conditions (Hafez and Hafez 2000). The findings are in agreement with earlier reports, suggesting that a higher placental weight relative to calf birth weight may be a characteristic feature of zebu breeds (Arthur *et al*. 2001).

In the present study, the mean postpartum weight of

Kangayam cows was 292.44±3.28 kg, with a range of 149–370 kg. The observed variation perhaps, reflected differences in parity, body condition score at calving, and nutritional management. Although breed-specific postpartum weight data for Kangayam cattle are limited in the literature, the observed pattern was consistent with general bovine postpartum physiology. Only in high-producing dairy cows, early lactation is associated with a pronounced negative energy balance (NEB) resulting in loss of body weight and condition which is often associated with delayed resumption of ovarian cyclicity and increased days open (Roche *et al*. 2009, Butler 2000). Kangayam cattle are traditionally draught-oriented and exhibit lower lactation demands. Therefore, although postpartum weight loss occurs in Kangayam cows, the metabolic stress associated with NEB is expected to be relatively moderate.

Birth weight of calf is significantly important as it reflects the prenatal growth of the calf and also indicates the size and vigor at the beginning of post-natal development and survivability of the newborn calf. The birth weight in calves is known to be affected by several factors such as gestation length, lactation number of the dam, sex of the calf, season of the year etc., (Kayastha *et al*. 2008). In the present study, the overall mean birth weight of Kangayam calves was 21.08 ± 0.23 kg, with values ranging from 14.2 to 27.8 kg. When analysed by sex, the mean birth weight of male calves (21.88 ± 0.32 kg) was higher than that of female calves (20.27 ± 0.30 kg), clearly indicating sexual dimorphism (Table 2) as reported earlier for Kangayam calves (Pattabhiraman 1958, Littlewood, 1936) and Ongole calves (Babu Rao 1990). This observation was in accordance with established reports that identify sex of calf as an important non-genetic factor influencing birth weight, with male calves generally exhibiting higher weights due to differential hormonal influences and enhanced prenatal growth (Upadhyay *et al*. 2017).

Investigations on Kangayam cattle performance have shown that the breed maintains consistent growth traits and adaptability under field conditions (Natarajan *et al*. 2012). In addition, contemporary genomic and physiological studies indicate that Kangayam cattle possess strong adaptive mechanisms, which may contribute to stable fetal growth and optimal birth weights under native management systems (Roshan *et al*. 2025). The slightly higher overall mean observed might be attributed to improvements in maternal nutrition, breeding practices, and scientific herd health management in recent years.

The majority of calves in the present study stood within 30 minutes to 1 hour (n=77), while some proportion of calves stood (Fig. 1) in less than 15–30 minutes (n=41), indicating the normal physiological window to stand-up. This was consistent with earlier reports that healthy calves typically stand within 30 minutes to 2 hours after birth. For instance, Edwards (1983) reported that most normal calves attempt to stand within the first hour of life, which closely matches our findings. Similarly, Houwing *et al*. (1990) observed that early standing (within 1 hour) is a strong indicator of calf vigor and successful parturition. A smaller proportion of calves in our study stood very quickly (0–15 minutes; 4 calves), which might reflect exceptionally vigorous neonates or optimal calving conditions. Comparable findings were reported by Barrier *et al*. (2012), who reported that calves born under minimal stress conditions may stand within the first 15–20 minutes postpartum. Only a few calves (n=3) took more than 1 hour to stand, which is slightly lower than some previous reports. Murray *et al*. (1987) indicated that delays beyond 1–2 hours can occur more frequently, especially in cases of hypoxia or dystocia. The lower number in present study suggested good calving management and minimal birth-related complications.

Kangayam calves took on average 50.88 ± 3.56 minutes (range: 10–240 minutes) to suckle colostrum on their own, which fits well within the biologically expected timeframe,

Fig. 1. Kangayam calf trying to stand after birth

Table 2. Weight of the calf and fetal membranes in Kangayam cattle

Parameters	Sex of the calf	
	Male	Female
Kangayam calf weight (Kg)	21.88±0.32	20.27±0.30
Average Kangayam calf weight (Kg)	21.08±0.23	
Weight of the fetal membrane (Kg)	2.84±0.07	2.65±0.08
Average weight of the fetal membrane (Kg)	2.75±0.05	
Percentage of weight of fetal membrane on its calf weight (%)	13.08±0.37	13.21±0.45
Average percentage of weight of fetal membrane on its calf weight (%)	13.15±0.29	

while also showing a relatively wide variation that is important to interpret. Most calves (n=118) in our study began suckling within the first hour, which was considered optimal for passive transfer of immunity. This agrees with the observations of Edwards (1983), who reported that healthy calves generally locate the udder and begin suckling within 1 hour. Similarly, Houwing *et al*. (1990) found that under normal calving conditions, suckling was usually initiated within 30–90 minutes postpartum, supporting the mean value. The lower end of the present range (10 minutes) indicated highly vigorous calves (n=3), which is in line with observations by Barrier *et al*. (2012), who reported that calves born without stress may initiate suckling very rapidly. However, the upper range in our study (up to 240 minutes) indicates that some calves (n=4) experienced delayed suckling. Comparable delays have been reported by Murray *et al*. (1987), who suggested that prolonged time to first suckling may be associated with factors such as dystocia, calf weakness, or poor maternal behavior.

It may be concluded that the mean gestation length in Kangayam cow was relatively longer and the time taken for delivery and for expulsion of the fetal membranes was found to be within the critical physiological limits. The mean weight of the fetal membranes was slightly higher, and the average postpartum dam weight loss was found to be moderate as this breed adapts well under field conditions when compared to exotic breeds. The mean birth weight of calves was 21.08 ± 0.23 kg and male were little heavier. Regarding neonatal behaviour, the average time taken for most calves to stand and to initiate colostrum suckling fell within the normal limits with minimal birth complications. These findings will help the indigenous cattle farmers for better health management practices in Kangayam cattle farming.

SUMMARY

The present study was conducted over a period of seven years (2019–2026) at the Kangayam Cattle Research Station, Sathyamangalam, with the objective to evaluate key parturient, postpartum, and neonatal parameters in Kangayam cattle, known for their superior draught ability and cultural significance in Tamil Nadu. A total of 125 Kangayam calves were born to 43 cows without any complications during parturition. During systematic recording and analysis, the mean gestation length was found to be 290.07 ± 2.59 days. The average time taken for delivery was 54.43 ± 3.73 minutes, while the time required for placental expulsion was 181.70 ± 5.69 minutes. The mean weight of the fetal membranes was 2.75 ± 0.05 kg, and the average postpartum dam weight was 292.44 ± 3.28 kg. The mean birth weight of calves was 21.08 ± 0.23 kg. Regarding neonatal behavior, the time taken for calves to stand was found to be 15-60 minutes with colostrum suckling initiated at 50.88 ± 3.56 minutes. The findings of this study provide baseline data on parturient and neonatal characteristics in Kangayam cattle, which can be useful for improving management practices, enhancing calf survival, and supporting conservation and breeding strategies for this valuable indigenous breed.

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