

Research Article

Evaluation of morphometric characteristics and performance of Totapari goats in their native habitat

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ABSTRACT

This study evaluates the morphometric features and performance of the Totapari goat breed. To study the morphometric features and performance of the Totapari goat, the first field survey in India was conducted in their native region in Alwar and Bharatpur districts of Rajasthan state during 2023-24. According to the interview schedule, a total of 36 villages were randomly selected based on the population of 10070 Totapari goats and 176 goat keepers were chosen through random sampling for this study. Data on morphometric features and performance were collected across various age groups of the animals. The Totapari goat is typically large in size and is considered the second largest goat breed in India, following the Jamunapari goat. The goat named "Totapari" is easily recognised by its distinctive parrot-like facial appearance, characterised by a Roman nose and inward-curving upper muzzle and nostrils which makes them stand out from other goat breeds. Totapari goat has a white coat with small brown spots or a completely pale-red colour on its head, neck and ears. The ears measure 29.41 ± 0.45 cm in length, with a long, flat and drooping ear. The nose has a Roman shape (double parrot mouth appearance) with a tuft of hair in male and the horns, which measure 17.26 ± 0.98 cm directed backward to medium size horns. Male goats have a long beard and the tail length averages 20.74 ± 0.46 cm. The overall body weight of male and female Totapari goats from birth to 18 months was recorded as 3.65 ± 0.02 to 88.86 ± 1.02 kg and 3.43 ± 0.03 to 64.54 ± 0.18 kg, respectively. The average chest girth, body length, and height at the withers were 48.69 ± 0.86 cm, 46.00 ± 1.16 cm and 47.27 ± 0.85 cm in males, and 78.61 ± 0.18 cm, 76.88 ± 0.18 cm and 77.18 ± 0.19 cm in females, respectively. The milk yield averaged 988.02 ± 1.96 gm per day, with milk containing $3.34 \pm 0.01\%$ fat and $8.25 \pm 0.01\%$ SNF (solids-not-fat). The average lactation period was recorded as 283.03 ± 0.26 days. The first mating occurred at 414.15 ± 3.99 days in males and 390.98 ± 1.66 days in females, with the first oestrus in females at 334.97 ± 2.61 days and an oestrus cycle duration of 20.22 ± 0.05 days. The first kidding was observed at 540.53 ± 1.84 days, with an average kidding interval of 360.85 ± 0.67 days. The average litter size for Totapari goats was 1.98 ± 0.01 , and the lifetime number of kiddings was recorded as 9.08 ± 0.09 . The findings provide insights into the breed's adaptability, productivity, and potential for genetic improvement, making it a valuable resource for sustainable livestock farming in arid and semi-arid regions.

Key words: Morphometric characters, Native tract, Productive performance, Reproductive performance, Totapari goat

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INTRODUCTION

India, with its vast and diverse agricultural landscape, has a deep-rooted connection with livestock farming (Rana, 2015). Goats hold a significant place among the various species reared across the country due to their adaptability, resilience, and diverse benefits (Sejian *et al.*, 2021). Goats are often referred to as the "poor man's cow" because of their affordability and the multiple products they provide, such as milk, meat, hide, and manure (Rana and Roy, 2024). They play a crucial role in the livelihood of millions of small and marginal farmers, particularly in arid and semi-arid regions where other forms of livestock may struggle to thrive (Kumar and Panth, 2003).

The significance of goats in India extends beyond their economic contributions. They are an integral part of the rural economy, providing a stable source of income and nutrition to households that may not have access to more expensive livestock like cattle (Neupane *et al.*, 2018). Goats require less feed and care, making them a sustainable option for resource-poor farmers (Lohani and Bhandari, 2021). Additionally, they contribute to the empowerment of women in rural areas, as goat-rearing is often managed by women, thereby enhancing their role in household decision-making and income generation (Adhiambo Onyango, 2023).

Among the various breeds of goats in India, Totapari goat is renowned for its unique appearance, valuable

attributes and adaptability (Noman, 2023), which is primarily found in the regions of Rajasthan. This goat is also known as the Alwari or Mewati goat among the farmers. Nowadays, Totapari goats have become increasingly popular among farmers for stall feeding. This breed is recognized for its meat production, high milk yield and sturdy nature, making it a valuable asset to farmers in these areas. Totapari goat is not only a source of milk but also provides meat that is highly valued in the market, contributing to both nutrition and income for the farmers. The reproductive capabilities of Totapari goats are notable. Does often give birth to twins, and occasionally even triplets. Their ability to produce offspring in multiple births contributes to their economic value in terms of meat and milk production (Noman, 2023). Furthermore, the Totapari goat's ability to thrive in diverse climatic conditions, ranging from dry to humid environments, makes it an ideal breed for the Indian context. Its resilience to diseases and low maintenance requirements add to its appeal, ensuring that it remains a popular choice among goat farmers as a stall feeding goat. As India continues to advance in agricultural innovations, the role of goats, especially unique breeds like the Totapari, will remain central to achieving sustainable and inclusive growth.

MATERIALS AND METHODS

The survey aimed to identify morphometric traits, body weight, biometry, raw milk constituents, production performance, and lactation length of Totapari goats in their native region. It was meticulously planned and executed across Alwar and Bharatpur districts in Rajasthan. In each district, two tehsils were selected, and a total of 36 villages were randomly chosen based on the population of 10070 Totapari goats. From these villages, 176 goat keepers were randomly selected for participation. An interview schedule was crafted to gather information on external body characteristics, body weight, biometry, productive and reproductive



Fig. 1: Measuring the body weight of Totapari goat using an electronic weighing scale.

performance, and lactation length. External body traits were recorded visually, while body weight was measured using an electronic weighing machine (Fig. 1). Biometric measurements were taken with a measuring tape (Fig. 2). Milk yield was recorded with an automatic electric milk meter, and individual milk samples (500 mL) were collected and analyzed in duplicates using an automatic milk analyzer (Lactoscan, SM Electronic & Trading) to determine milk constituents. Lactation length was monitored visually until the daily milk yield decreased to 200 mL. The survey participants were intentionally chosen to represent a broad spectrum of the community.



Fig. 2: Measuring biometric parameters of Totapari goat with a measuring tape.

RESULTS AND DISCUSSION

Natural Habitat and Distribution

The Totapari goat is primarily found in the Alwar and Bharatpur districts and surrounding areas of Rajasthan, India (Fig. 3). While the exact origin of this breed remains uncertain, local goat breeders in Badbara village, Govindgarh tehsil of Alwar district, have reported that these goats have been raised within their families for several generations. The breeding region of the Totapari goat is located in Western India, at coordinates 27°14' 05" - 27°37' 10" N & 76°37' 30" - 77°11' 45" E, covering an estimated area of 1500 sq km. The goats are primarily raised under an extensive grazing system. But nowadays, Totapari goats have become increasingly popular among farmers for stall feeding. Goat rearing is vital for the livelihood and economic stability of the local farmers, with most reporting that they have been raising this breed for 20 to 50 years. According to the 20th Livestock Census

(2019), Rajasthan's total goat population stands at 20,840,203, representing 31.02% of the national goat population (148.88 million). Specifically, the goat populations in the Alwar and Bharatpur districts were recorded at 403,117 and 168,158, respectively (GOI, 2022).

The climate of this region can be classified as tropical steppe and flood-prone eastern plain for Alwar and Bharatpur districts. The area experiences

predominantly dry conditions, with extremely hot summers (reaching up to 40°C) and cold winters (dropping to around 8°C), except during the monsoon season. The average annual rainfall ranges from 500 to 700 mm, distributed unevenly across the region. The area lies on the alluvial deposits left by the Yamuna River and its tributaries, covering the eastern part of the state and forming the western edge of the Indo-Gangetic plain.

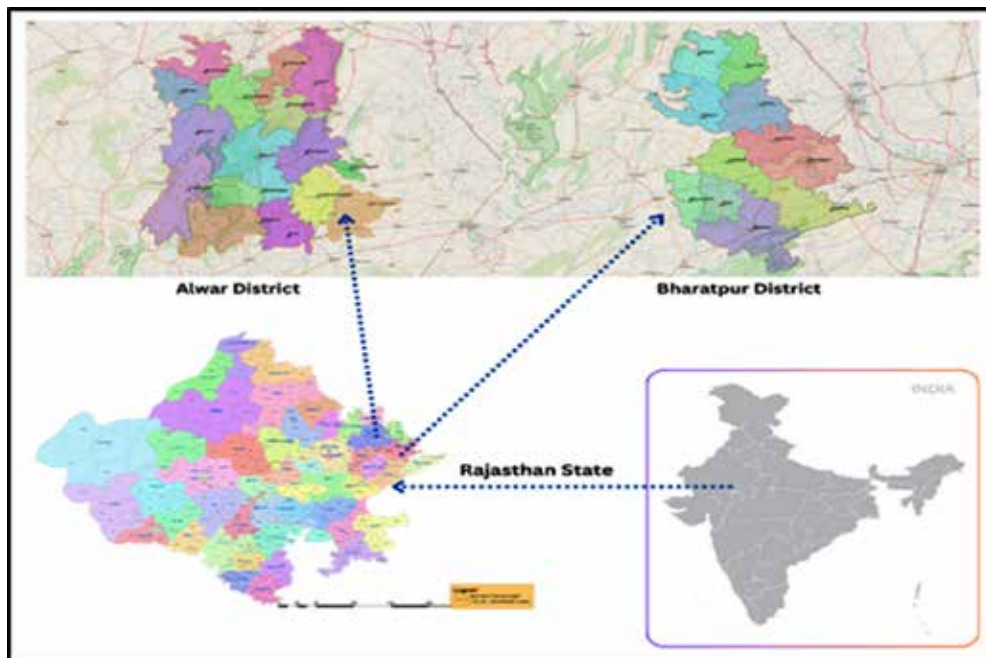


Fig. 3: Selected survey areas in Alwar and Bharatpur districts of Rajasthan, located between 27°14'05" - 27°37'10" N and 76°37'30" - 77°11'45" E.

Physical Appearance

The Totapari goat is dual-purpose breed (chevon and milk), and found in the Alwar, Bharatpur, and surrounding districts of Rajasthan. These goats are typically large in size. The goat named "Totapari" is easily recognised by its distinctive parrot-like facial appearance, characterised by the pronounced Roman nose, which is a result of their distinctly arched nasal bone and inward-curving upper muzzle and nostrils (Fig. 4), which makes them stand out from other goat breeds. Farmers also refer to this goat as the Alwari or Mewati goat. Totapari goat has a white coat with small brown spots or a completely pale-red colour on its head, neck and ears (Fig. 5 and 6). It has a long, flat and drooping ear with 29.41 ± 0.45 cm in length. The nose has a Roman shape (double parrot mouth appearance) with a tuft of hair in males and the horns, which measure 17.26 ± 0.98 cm directed backward to medium size horns. Male goats have a long beard and the tail length averages 20.74 ± 0.46 cm. Other notable physical features include a large mouth, long and strong

legs. The udder is medium-sized with medium teats. The hoofs colour is predominantly light black to brown.



Fig.4: Double parrot mouth appearance with a Roman nose, tuft of hair and inward-curving upper muzzle and nostrils in adult Totapari male goat.



Fig. 5: Totapari goat with a pure white coat and small brown spots on its head, neck, and ears.



Fig. 6: Totapari goat with a pure white coat and completely pale-red colour on its head, neck and ears.

Body Weight and Biometry of Totapari Goats

The average body weight and biometry of Totapari goats across different age groups are presented in Tables 1 and 2. The body weights at various ages as birth, 3 months, 6 months, 12 months, 15 months, and 18 months were recorded as follows for male goats: 3.65±0.02 kg, 23.03±0.12 kg, 31.16±0.28 kg, 55.00±1.70 kg, 40.21±0.54 kg, and 88.86±1.02 kg, respectively. For female goats, the corresponding body weights were 3.43±0.03 kg, 22.04±0.05 kg, 30.55±0.13 kg, 40.82±0.15 kg, 43.85±0.17 kg, and 64.54±0.18 kg. The mean body

weight significantly increased from birth to adulthood. Various factors, including environmental conditions, type of feed, health status, age, sex, and management systems has been influenced the body weight of the goats (Bharathidhasan *et al.*, 2009). However, another study by Noman (2023) recorded similar body weights in Totapari goats. Similar trends in body weight have been observed in other goat breeds, such as Jakhrana goats (Bhusan, 2012), Sangamneri goats (Patil *et al.*, 2013) and Sojat goats (Gupta *et al.*, 2021).

Table 1: Body weight of Totapari goats at different age groups.

Body weight at	Male			Female		
	Mean±SEM	Range	N	Mean±SEM	Range	N
Birth	3.65±0.02	3-4	471	3.43±0.03	3-4	225
3 Month	23.03±0.12	21-28	198	22.04±0.05	20-26	1115
6 Month	31.16±0.28	22-38	128	30.55±0.13	20-38	667
12 Month	55.00±1.70	55-55	6	40.82±0.15	34-55	906
15 Month	40.21±0.54	40-40	120	43.85±0.17	32.62	1383
18 Months & above	88.86±1.02	85-97	126	64.54±0.18	50-90	4725

In Table 2, the chest girth, body length, and height at the withers in male goats were recorded as 48.69±0.86 cm, 46.00±1.16 cm, and 47.27±0.85 cm, respectively. The corresponding measurements for female goats were 78.61±0.18 cm, 76.88±0.18 cm, and 77.18±0.19 cm. These biometry parameters as chest girth, body length, and height at the withers showed a significant increase

from birth to 18 months of age. Similar trends related to chest girth, body length, and height at the withers in Totapari goats were observed by Noman (2023). Previous studies have also reported that biometric measurements in goats can be influenced by factors such as increasing age and body weight (Gupta *et al.*, 2021; Samad, 2021).

Table 2: Biometric measurements (cm) of Totapari goats.

Body measurements	Male			Female		
	Mean±SEM	Range	N	Mean±SEM	Range	N
Chest girth	48.69±0.86	20-102	1049	78.61±0.18	15-102	9021
Body length	46.00±1.16	15-97	1049	76.88±0.18	15-97	9021
Height at withers	47.27±0.85	18-102	1049	77.18±0.19	15-102	9021

Raw Milk Constituents, Milk Yield and Lactation Length

The Totapari goat is renowned for its milk production potential (Table 3). The average milk yield was recorded at 988.02 ± 1.96 gm/day, with a range between 500-1500 gm. The milk was found to be rich in fat, averaging $3.34 \pm 0.01\%$, and solids-not-fat (SNF) content, averaging $8.25 \pm 0.01\%$. The average lactation length for Totapari goats was 283.03 ± 0.26 days, with a range between

250-300 days. Similar values for the reproductive performance of selected breeds were observed within the estimated range for dairy goats (Kumar *et al.*, 2004; Bhateshwar *et al.*, 2022; Singh *et al.*, 2023). Several factors, including the type of feed, breed, age, the purpose of the animal, stage and length of lactation, milk yield, frequency of milking, and timing of milking, can influence raw milk constituents, milk yield, and lactation length (Hristov *et al.*, 2020; Adamu, 2021).

Table 3: Dairy performance of lactating Totapari goats.

Female production traits	Mean \pm SEM	Range	N
Daily milk yield (gm)	988.02 \pm 1.96	500-1500	6108
Total lactation milk yield (kg)	282.71 \pm 0.20	260-300	4725
Lactation length	283.03 \pm 0.26	250-300	4725
Fat%	3.34 \pm 0.01	2.3-4.1	6108
SNF %	8.25 \pm 0.01	3.1-9.4	6105

Reproductive Performance

Table 4 details the reproductive performance of male and female Totapari goats. The age at first mating was recorded as 414.15 ± 3.99 days for males and 390.98 ± 1.66 days for females. In females, the age at first oestrus was observed to be 334.97 ± 2.61 days, with an oestrus cycle duration of 20.22 ± 0.05 days. The age at first kidding was 540.53 ± 1.84 days, with

an average kidding interval of 360.85 ± 0.67 days. The average litter size in Totapari goats was 1.98 ± 0.01 and the lifetime number of kiddings was 9.08 ± 0.09 . These results are consistent with findings from previous studies by (Pathodiya *et al.*, 2010; Patel and Pandey, 2013; Bhateshwar *et al.*, 2022), which also investigated reproductive performance in goats.

Table 4: Reproductive performance of Totapari goats.

Parameters	Mean \pm SEM	Range	N
Age at first mating in male (days)	414.15 \pm 3.99	290-510	252
Age at fast mating in females (days)	390.98 \pm 1.66	290-510	1383
Age at first oestrus (days)	334.97 \pm 2.61	210-510	906
Oestrous cycle duration (days)	20.22 \pm 0.05	17-24	901
Age at first kidding (days)	540.53 \pm 1.84	390-660	1383
Kidding interval (days)	360.85 \pm 0.67	270-450	4725
Service period (days)	49.25 \pm 0.13	30-60	6783
Litter size	1.98 \pm 0.01	1-3	6098
Lifetime number of kidding	9.08 \pm 0.09	7-15	670

CONCLUSION

This study provides a comprehensive overview of the morphometric characteristics, as well as the productive and reproductive performance of Totapari goats in Rajasthan, India. Totapari goats are typically large with a robust body structure. They have a distinctive appearance, characterized by a white coat with small brown spots or completely pale-red colour on the head, neck and ears. The ears are long, flat, and drooping and the nose has a Roman shape with a tuft of hair in males. Their horns are medium sized and directed

backward. Male goats are distinguished by a long beard and a medium sized tail in both sexes. These features make the Totapari goat distinct from other regional goat breeds. The productive and reproductive traits of Totapari goats are also superior to those of local goats. To increase the Totapari goat population, it is crucial to use elite breeding bucks on a large scale and implement systematic breeding plans for faster genetic improvement. Field survey results indicate that this breed has significant potential to enhance goat breeding programs, particularly in achieving higher weight

gain and milk production through selective breeding. Therefore, it is important to recognize and register the Totapari goat as a distinct breed at the national level.

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