high burdens of parasitism and lameness, culminating in reduced growth, reproduction, and increased mortality despite the apparent environmental adaptability of goats (Sejian et al., 2021).

Sanitation and general farm management also influence the prevalence of vector-borne and reproductive pathogens that indirectly affect growth by causing abortions, weak kids, and chronic debilitation. Studies in tropical dry-forest systems demonstrate that herds with poorer infrastructure and less structured sanitary management experience higher seroprevalence of agents such as Neospora caninum and bluetongue virus, whereas larger herds with better facilities show lower infection levels, underscoring the role of housing, vector control, and waste management in disease ecology (Gutiérrez et al., 2024). Regular monitoring for zoonotic and production-limiting parasites, prompt treatment of clinically affected animals, and avoidance of practices like spreading fresh feces on pastures all contribute to reduced environmental contamination and lower reinfection rates. Integrating these biosecurity and sanitation measures with tailored nutrition and vaccination creates a health-oriented production system in which goats can express their genetic growth potential more fully.

7 Environmental Factors Affecting Growth Performance

7.1 Regulation of temperature, humidity, and light conditions

Thermal environment is one of the main external factors modulating feed intake, energy use, and thus growth performance in goats. When temperature-humidity index (THI) rises above comfort thresholds, goats show increased respiratory rate, heart rate, and skin temperature, reflecting a higher energetic cost of thermoregulation that diverts nutrients away from growth (Figure 3) (Zhou et al., 2023). Experimental exposure to stepwise combinations of higher temperature and relative humidity demonstrated that, at THI ranges above about 75-80, goats reduce behaviors related to metabolism (feeding and rumination) and shift toward behaviors that enhance evaporative cooling, such as panting and increased water intake. Under hot, humid tropical conditions, rectal and skin temperatures, respiration rate, and lying time increase, while dry matter intake declines, confirming that prolonged heat load depresses nutrient intake and growth even in heat-adapted breeds (Ali et al., 2023).

Maintaining environmental conditions within the thermoneutral range, or at least limiting time above critical THI, is therefore essential to protect growth response to improved feeding. Reviews of heat stress in goats indicate that, beyond reduced intake, chronic high temperatures alter endocrine and immune function, leading to impaired metabolic efficiency and increased disease susceptibility that further constrain performance (Gadzama et al., 2025). Goats are resilient to heat compared with other ruminants, but their productivity and welfare still deteriorate markedly once ambient temperatures exceed about 38 °C, especially when combined with high humidity that limits evaporative cooling (Stavetska et al., 2025). Managing diurnal variation by exploiting cooler night or early morning periods for feeding and activity can help offset reductions in daytime intake and mitigate negative energy balance in hot environments (Danso et al., 2024).

Light conditions also interact with growth and product yield, particularly in cashmere goats, where controlled short-day photoperiods have been used to manipulate fiber growth. In Shanbei white cashmere goats, reducing daily light exposure to seven hours increased annual cashmere production by about one-third, demonstrating the strong photoperiodic control of secondary hair growth (Cui et al., 2023). However, the same short-photoperiod system increased concentrations of harmful gases such as ammonia in the barn, implying that without adequate ventilation, air quality and health may be compromised despite gains in fiber output. For meat-oriented systems, providing natural or artificial shade reduces solar radiation and contributes to lowering heat load, supporting higher feed intake and growth rates under hot conditions.

7.2 Housing design and ventilation management

Housing design strongly influences the microclimate experienced by goats and thus the extent to which heat stress erodes the benefits of improved nutrition. Studies comparing different housing systems during hot–humid seasons show that modified sheds can reduce respiration rate and improve thermal comfort relative to conventional housing or fully open environments, even when rectal temperature remains within a narrow range across systems (Singh et al., 2023). Cross-ventilated barns and shade structures are highlighted as core environmental modifications, lowering heat load by reducing solar gain and facilitating convective and evaporative heat loss,