

# PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF IMPORTED DAIRY COWS UNDER SAHARAN CLIMATIC CONDITIONS IN ALGERIA: CASE OF GHARDAÏA PROVINCE

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This study aims to evaluate the productive and reproductive performance of 111 dairy cows from five European breeds (Black Holstein, Red Holstein, Montbéliarde, Fleckvieh, and Brown Swiss), raised in arid regions by analyzing the effects of extreme climatic conditions on their zootechnical performance. The research was conducted during the spring and summer seasons on a private farm located in Gharđaia (Algeria), a typically Saharan area characterized by a hot and dry climate. Weekly milk yield was monitored individually, and milk composition (fat and protein content) was determined using a Lactoscan analyzer. Reproductive data were extracted from a computerized herd management system, allowing the calculation of several fertility parameters: calving to first insemination interval, conception delay, calving interval; and fecundity indicators: success rate at first artificial insemination (SRAII) or at first natural service (SRNSI), percentage of cows with three or more inseminations, and the average number of inseminations per conception. Climatic data (ambient temperature and relative humidity) were retrieved from the NASA POWER database to calculate the temperature-humidity index (THI), using the National Research Council (1971) formula. All data were processed using Statistica software for statistical analysis. The distributed rations allowed for an average milk yield of  $7709.24 \pm 1435.46$  kg per lactation, reflecting a generally adequate nutritional management despite unfavorable climatic conditions. However, the fat/protein ratio, estimated at 1.01, falls below the reference range (typically between 1.2 and 1.5), which may be an early indicator of subacute ruminal acidosis (SARA). From a reproductive perspective, natural service resulted in a significantly shorter conception delay compared to artificial insemination (80.5 vs. 158 days), although the success rates remained low (SRNSI = 44%, SRAII = 17%), suggesting a likely impairment of reproductive functions under heat stress. THI analysis identified three stress classes: mild (THI =  $60 \pm 7.19$ ), moderate (THI =  $74.67 \pm 1.07$ ), and severe (THI =  $83.74 \pm 2.77$ ). Increased THI was associated with a significant decline in milk production and milk solids content, as well as deterioration of reproductive parameters and an increase in respiratory rate ( $p < 0.05$ ), indicating a marked physiological impact of thermal stress. During moderate thermal stress periods (THI = 73.1), the Brown Swiss breed demonstrated superior thermal resilience, with a significantly lower respiratory rate compared to Holsteins ( $37.0 \pm 3.1$  vs.  $57.3 \pm 5.2$  breaths/min, respectively), highlighting its ability to maintain physiological functions in a harsh environment. These results suggest that selecting heat-tolerant breeds, such as the Brown Swiss, represents a relevant strategy to safeguard dairy production in arid zones. This study highlights the physiological limitations of imported breeds under thermal stress and emphasizes the need for integrated approaches (genetic selection, herd management, and environmental control) to mitigate the effects of climate change on dairy systems. Further research, conducted on larger animal populations, is needed to validate these observations and support the development of effective adaptation strategies for livestock systems facing future climate uncertainties.