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Assessing the heat tolerance of Alentejana and Mertolenga portuguese cattle breeds under influence of solar radiation

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Objectives: During summer in Mediterranean regions, well adapted native cattle breeds present differences in environmental tolerance. The objective of this study was to compare heat tolerance of Alentejana and Mertolenga heifers under direct solar radiation, by quantifying the pathways of evaporative thermolysis and thermostability.

Materials and Methods: The experiment was carried out in 5 days. 6 Alentejana and 6 Mertolenga heifers were kept under direct solar radiation, in individual stalls (3.0 — 1.1 m) and restrained by head halted. Food, water and mineral mixture were available ad libitum. Respiratory frequencies (RF) were measured by observing costal movements, rectal temperatures (RT) were measured using a digital thermometer (Digitron, with an 8-cm flexible probe) and thermal balance was calculated according to procedures described by Silva et al., (2010). These measurements were carried out every day at 06:00, 10:00, 13:00 16:00 and 20:00h. Heat storage (HS) was calculated as described by McGovern and Bruce (2000). Sweat rate was measured at 15:00 hours using methodology described by Pereira et. al. (2010).

Variables were analyzed according to a general linear model procedure with 2 fixed factors (breed and hour) and 1 nested factor (animal within breed).

Results: Except for the cases of RT and HS, in the other variables no significant differences between the breeds were found. Despite the absence of significant differences in the thermal balance between breeds, there was a slightly tendency for a bigger acquisition of heat in Alentejana and a faster recovery in the Mertolenga after 16:00h. The sweating rates were not significantly different, with mean values of 271.5 and 286.3 (g.m⁻².h⁻¹) respectively for the Alentejana and Mertolenga. Respiratory frequencies were virtually equal between breeds. In RT there were significant differences between breeds. The Mertolenga has shown significantly lower RT at 16:00h and 20:00h, with 38,9°C and 38,7°C compared to 39,3°C and 39,1°C in Alentejana. The same trend was found in the HS at 16:00h and 20:00h with 0,018 and 0,016 W.m² in Alentejana compared to 0,014 and 0,009 W.m² in Mertolenga.

Conclusions: The results show that both breeds present good heat tolerance. The sweating rate values of both breeds are very high and are quite similar to those found in tropical cattle breeds. However, Mertolenga shows slightly better thermal balance and evaporative heat loss (SR and RF), which eventually may have contributed to the enhanced thermostability comparatively to Alentejana. The superior stability of the RT and particularly the lower HS suggest a higher heat tolerance of Mertolenga breed.