THE POSSIBILITY OF USING INFRARED THERMOMETRY AS A NON-INVASIVE METHOD FOR ASSESSING THE RESPONSE OF COWS TO THE INFLUENCE OF ENVIRONMENTAL FACTORS

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Body temperature is a vital indicator that can provide valuable insight into the overall health and well-being of cattle. Recent studies in the field of animal health and production have shown that infrared thermography (IT) can be a useful tool for assessing the stress and well-being of animals. Measuring the temperature of the rectum, which is commonly used to check an animal's health, can cause stress and therefore lead to false results in experimental studies of productive animals. In this sense, IT is an alternative because it is a modern, safe and non-invasive method of visualizing the animals thermal profile. It is a useful tool for assessing the animals temperature stress because it detects changes in peripheral blood flow and minimal fluctuations in body temperature.

The purpose of the study was to investigate the possibility of using infrared thermometry to evaluate the environmental impact on cows.

Studies on Holstein cows with an average daily yield of 24–26 kg from January to August 2018 with year-round unmanned boxing animals kept in lightweight housing. The room temperature and humidity were measured with a professional *Benetech GM 1360* thermometer (*Shenzhen Jumaoyuan Science and Technology Co. Ltd*., China). The Temperature and Humidity Index (THI) was calculated according to N. Kibler (1964). The skin surface temperature (ST) in the middle third of the neck was determined by a thermal imaging pyrometer *Flir TG165* (*FLIR Systems*, USA) with an emission factor of 0.98 from a distance of approximately 1.5 m from the animal. Rectal temperature (RT) was measured with a *Microlife MT 3001* electronic thermometer (*Microlife*, Switzerland). The obtained figures are presented as median values, maximum and minimum deviations. Mathematical data processing was performed using the built-in statistical functions in *Statistica 10* (*StatSoft Inc*., USA). The differences between the samples, determined by the U-test of the Mann-Whitney (U-test), were considered to be significant at $P<0.05$.

At an air temperature lower than the comfort zone for cows +4.6 (–5.4…+ 5.9) °C, the ST (n = 461) was 18.1 (9.2–24.9) °C the coefficient of variation of this indicator CV = 16.00 %. The correlation between ST and THI (43.1 (28.6–45.2)) was weak (r = 0.298; $P<0.05$). Within the range of +15.6 (10.8–25.6) °C, the ST (n = 783) was at the level of 29.1 (19.7–35.1) °C (CV = 10.12 %). The relationship between ST and THI (59.6 (52.3–72.2)) was strong (r = 0.703) with a coefficient of determination sufficient for regression modeling (R2 = 0.493; $P<0.05$). At critical high air temperatures for cattle +30.7 (28.7–34.2) °C, ST (n = 390) animals increased to 34.4 (30.6–36.9) °C (CV = 3.27 %). The correlation between ST and THI (78.4 (76.1–81.1)) was authentic with medium power (r = 0.543; R2 = 0.294). In all cases, the relationship between ST and THI was higher than that between ST and air temperature.

The simultaneous (n = 45) determination of RT (38.4 (37.7–39.2)) and ST (34.4 (31.8–36.8)) confirmed a significant correlation between these indicators and THI (78.2 (76.3–81.5)) — r = 0.435 (R2 = 0.435; $P<0.05$) and r = 0,792 (R2 = 0.628; $P<0.05$), respectively. The correlation was low between RT and ST, r = 0.344 (P = 0.021) with a low coefficient of determination (R2 = 0.118; $P<0.05$).

In assessing and predicting the response to environmental factors, it is promising to determine the animals body temperature (r = 0.792; R2 = 0.628) using infrared thermometry. This method is more convenient and less stressful in terms of productive animals well being.

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