



Providing shade on pasture - Influence of shade location on heat stress of grazing dairy cows

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Key words

Heat stress, dairy cows, grazing, shadow, mitigation, monitoring

Aim of the study

The project aimed to address the following research questions: (i) Does the alleviating effect of shade on heat stress in grazing dairy cows depend on the shade location on pasture? (ii) Do cows that seek shade differ in their characteristics from cows that do not seek or seek less shade? (iii) Is heat stress detectable by non-invasive indicators as milk composition (electrolyte and cortisol concentrations), exhaled breath and urine (volatile organic compounds (VOC))?

Material and methods

The experiment took place from May to August 2023 and consisted of six measurement periods, each lasting six days. The mean daily comprehensive climate index (CCI) during this period was 27.2 °C. Twenty-four dairy cows participated in the experiment, divided into six groups of four animals at the start of each period. The groups rotated on six 75-are paddocks to graze every day, alternately, on a paddock of one of two shade conditions: the shade sail was placed either in proximity to the water trough (3-m distance, PROX) or in a 60-m distance (DIST). Milk production and composition, heart rate, body (i.e., vaginal) temperature, water intake, location on pasture (using shade or not, proximity to water trough), physical activity and body weight were recorded on an individual level. Exhaled breath and urine samples were taken on one day of each measurement period both in the morning and afternoon.

Results and significance

With increasing environmental heat load, i. e. CCI, body temperature, heart rate and water intake increased. An increased body temperature was significantly associated with decreased levels of milk fat and lactose and phosphorus and tendentially with increased milk cortisol levels. The PROX cows had lower maximum vaginal temperatures in the observation window around noon (11h30 – 14h30) than DIST cows. The animals used shade in up to 59 % of the observation time (08h30 – 14h30 and 17h30 – 20h30). The time of using shade increased with increasing body temperature and with the shade sail being in proximity to the water trough, a greater milk production and fewer days in milk, and depended further on the time of the day (greater shade use in the morning than afternoon/early evening). The animals were in proximity to the water trough in up to 30% of the observation time. Throughout the whole day (08h30 – 20h30), PROX cows spent more time in shade and less time in proximity to the water trough than DIST cows. The analysis of volatile organic compounds in exhaled breath and urine is still pending. Although not all analyses have been completed, the results indicate that the use of shade is related to the position of the water trough.

Publications, posters and presentations

Due to lack of human resources (no doctoral student was found for the project), the data analysis is still ongoing and therefore, the data will only be ready for publishing at the end of 2024. First results have been published in a master thesis at the Veterinary Faculty of the University of Bern.

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Project duration May 2023 – April 2024