Spatial Variability of Microclimatic Parameters in a Closed Compost-bedded Pack Barn for Dairy Cows with Tunnel Ventilation

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**Abstract.** The development of breeding systems contributing to improve animal welfare and to increase productivity and milk quality, with a sustainable use of resources, is one of the main challenges of modern dairy farming. The aim of this study was to evaluate the spatial distribution of microclimatic conditions inside a closed Compost-Bedded Pack Barn (CBP), equipped with a negative ventilation system in tunnel mode, associated with an evaporative cooling system (EC), through geostatistical analysis. The research was conducted during the summer season in a compost barn placed in the area of Zona da Mata, in the state of Minas Gerais, the largest milk producing state in Brazil. In different periods of the day, microclimatic parameters were measured inside the building, such as air temperature, relative humidity, air velocity. Temperature and Humidity Index and enthalpy were subsequently calculated. The results showed the predominance of strong and moderate spatial dependence, as well as variability of attributes within the CBP installation, with heat stress zones occurring. It was verified, by kriging maps, that the most critical housing conditions were mainly found from the central part of the CBP installation towards the northwest face, close to the exhaust fans. On summer afternoons, the entire area of the CBP was in a situation of discomfort. The distribution of air velocity throughout the total internal area of the facility always remained below 2 m s-1. As a result, it is possible to affirm that an increase in the ventilation flow inside the building could allow to reach more favourable conditions for the thermal comfort of the animals. It was observed that the EC can help to improve the internal thermal conditions of the barn. However, probably due to the lack of thermal insulation of the enclosures, it does not allow to reach a spatial thermal uniformity and to create comfortable conditions for dairy cows during the critical summer period.