

Potential and challenges of applying infrared thermography in dairy farming

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Abstract

The aim of this paper is to present the possibilities of applying thermography in farm conditions but also to present some of the challenges of their application. Infrared thermographic images of the hooves were obtained using a stationary thermal camera under farm conditions. The results were different, but still with a fairly high percentage of accuracy in the assessment, of at least 75% and above accuracy in selecting suspicious cows. While there is considerable potential, challenges remain, such as the farm differences, contamination of the hooves with impurities from urine and feces, splashing with water by farm workers, and similar.

1. Introduction

Infrared thermography is becoming increasingly popular in animal production, favoring non-invasive techniques for monitoring animal health and welfare. In dairy cattle, hoof diseases and lameness represent a major health and welfare concern, leading to reduced productivity and increased treatment costs. The application of infrared thermography offers a promising approach for the early detection of such conditions. According to our experiences and the experiences of other authors, sick cows' hooves have a significantly higher temperature than healthy hooves (Bobić et al., 2024.). Lameness prevention is extremely important in intensive milk production, not only due to the economic losses but also because of its impact on animal welfare and their productive life.

2. Material and methods

The studies were conducted on commercial dairy farms. Infrared thermographic images of the hooves were obtained using a stationary thermal camera under farm conditions. Surface temperature values were recorded at predefined regions of interest on each hoof (Bobić et al., 2017.). Based on the analysis of the thermal records and evaluation of the cow's lameness score (Bobić et al, 2026.), the selection of cows was made for further examination. With the selection and examination of the suspected cows, we had the aim of early detection of the disease and prevention of lameness.

3. Results

Combining infrared cameras with locomotion scores has proven successful. The results were different, but still with a fairly high percentage of accuracy in the assessment, of at least 75% and above accuracy in selecting suspicious cows. While there is considerable potential, challenges remain, such as the farm differences, difficulties with animal identification, contamination of the hooves with impurities from urine and feces, splashing with water by farm workers, etc.

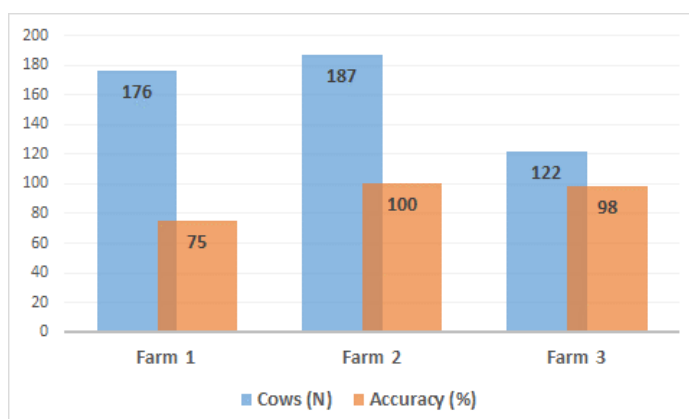


Figure 1. Results of the combining infrared cameras with locomotion score.



The health status of the hooves in combination with the lameness score revealed a certain temperature distribution pattern (dispersion), as shown in Figures 2 and 3. The number of observed hooves and their corresponding temperature values reflected the lameness score category and the underlying health status. In healthy hooves, their number and temperature values were skewed to the left, i.e., towards lower lameness score values (LS0 and LS1 scores dominate compared to LS2 and LS3 scores), while in unhealthy hooves, the opposite results were obtained gravitating towards the highest lameness score values (LS1, LS2 and LS3 scores being more prevalent than LS0).

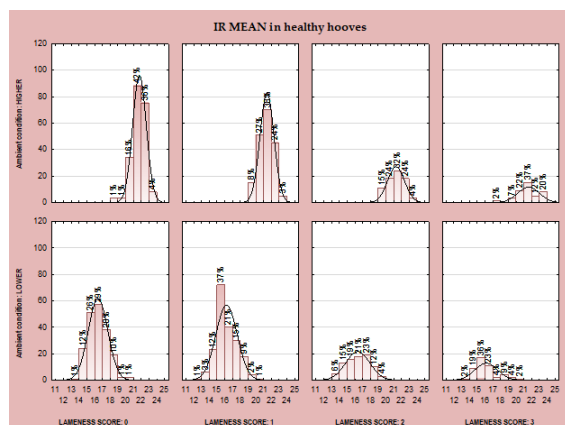


Figure 2. Distribution of temperature values of the IR MEAN in healthy hooves regarding to lameness score and ambient condition.

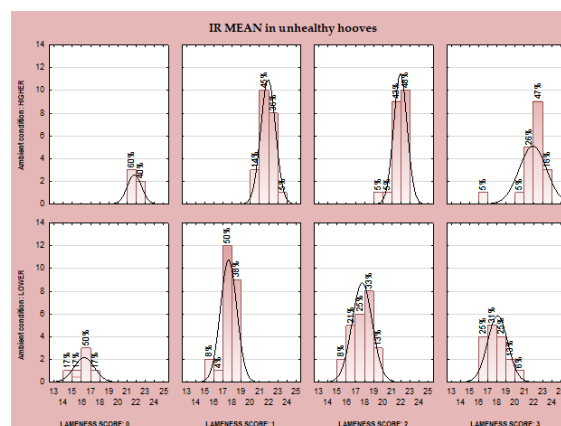


Figure 3. Distribution of temperature values of the IR MEAN in unhealthy hooves regarding to lameness score and ambient condition.

4. Conclusion

In conclusion, infrared thermography shows potential as a complementary diagnostic tool for the early identification and monitoring of hoof health, contributing to improved disease management and animal welfare on dairy farms. Further research is needed to develop optimal integration of different methods to improve the accuracy and efficiency of infrared thermography application and to find ways to overcome problems in practice.

References

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