HEAT STRESS IN DUTCH DAIRY CATTLE DURING SUMMER

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Introduction

Although the Netherlands are located in the moderate climatic zone of the globe, during the summer, temperatures can sometimes pass the 30°C for several days in a row. During the summer of 2003 temperatures were high for several months. Therefore, it is important to know when and how dairy cows suffer from heat stress and how a farmer can help the cows in coping with it.

When environmental temperatures raise above the upper critical temperature (UCT) cows will need extra energy for cooling and will eat less. This results in a lower milk yield [4]. The UCT for lactating dairy cattle depends on their production level and can vary from 15°C-24°C [1,2,4,5]. A cow that produces 30 kg of milk per day will start sweating at an environmental temperature of 12°C [2]. Under Dutch climatic conditions the maximum daily temperature is very often above this level. However, Dutch farmers do not see heat stress as a major problem, although the reduction in milk yield can be as large as 33% [4]. The management of the ventilation in the dairy barn is of major influence in this respect [6,7]

Materials and methods

Thirteen Dutch dairy farms were selected on the basis that they had electronic milk yield recording. Three farms housed their cows outside during the summer, seven kept them inside when it was warm and outside at lower temperatures (e.g. during the night, or during rainy days) and three farms kept the cows inside all the time. On each farm 5 cows were selected that were between 100 and 120 days in lactation at the start of the study. During six weeks in the summer (July 28 – September 7) of 2003 the daily milk yield of those cows, environmental maximum, minimum and average daily temperature and the humidity were recorded. Correlations between temperature, humidity and milk yield were calculated using general linear model in SPSS. Farms were grouped according to the fact that the cows were housed outside at all times, outside/inside or inside at all times.

Results

The summer of 2003 proved to be very warm at the beginning of our recording period. At the end of August temperatures dropped to normal values, which made a comparison possible. In figure 1 the milk yield of an individual cow, kept outside without shade, is presented in relation to maximum and average environmental (daily) temperature. It can be seen that the milk yield declines after a few days of higher temperatures. When the daily temperatures drop, milk yield increases again. In figure 2 the milk yield of a cow that was kept inside during the same period is presented. It can be seen that there is no reduction in milk yield, although the daily (outside) temperature was high.

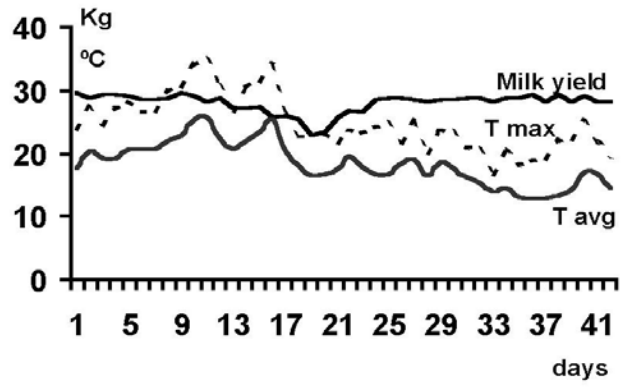

Figure 1. Milk yield of an individual cow, kept outside without shade, in relation to maximum and average daily temperature.

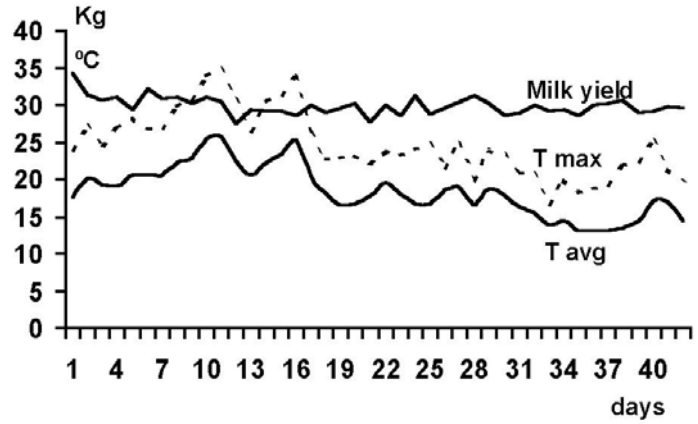

Figure 2: Milk yield of an individual cow in relation to maximum and average daily (outside) temperature when the cow was kept inside during the same period as the cow in figure 1.

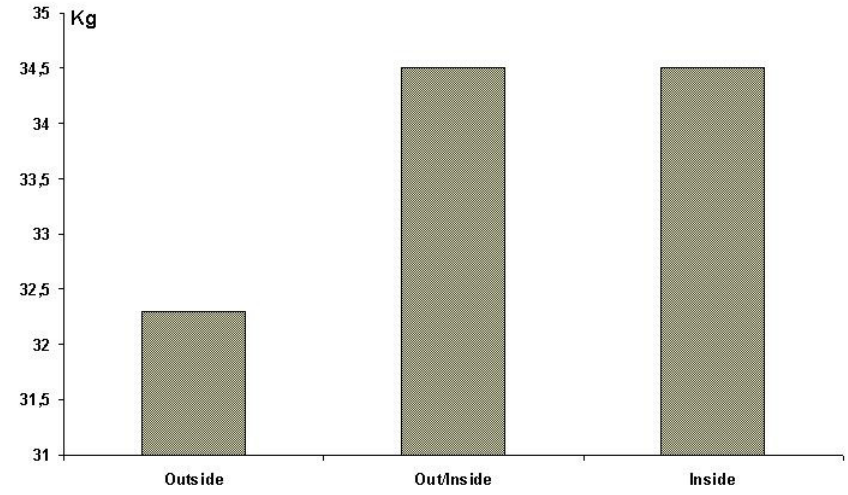

Figure 3: Mean milk yield of the farms during the entire 6 weeks period. Cows were housed outside all day, outside during cooler periods (e.g. at night) and inside during warm, sunny days, or inside at all times.

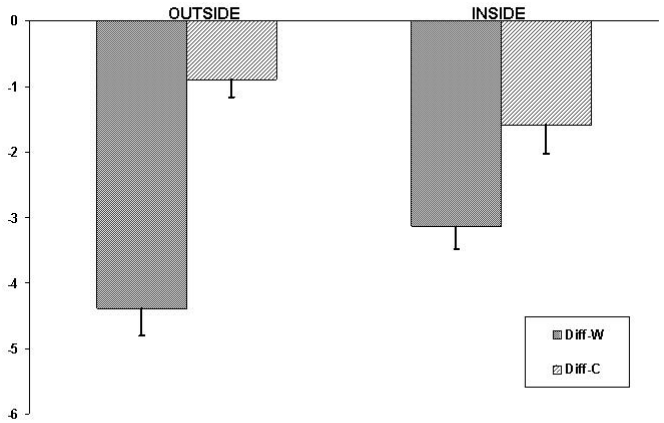

Figure 4: Mean milk yield (in Kg's) of the farms that kept their cows outside or inside during a hot week (Diff-W) and a week with moderate temperatures (Diff-C). Milk yield is represented as the difference of the actual yield compared with the expected yield.

Discussion

In our study we confirmed previous reports that cows have a reduced milk yield during warm periods. It is obvious that cows need shade during warm, sunny, periods [8]. However, congregating in shade can result in manure accumulation and reduced pasture fertility. There is also a perception by farmers that providing shade may reduce the time that cattle spend

grazing. A solution to this problem could be to house the cows inside during warm periods. At least during daytime. This requires appropriate housing facilities with insulated roofs and ample ventilation[6]. Additional cooling could be an advantage, but the cost-effectiveness of such systems has to be determined [3].

The barns in the present study did not have cooling equipment. This could be an explanation for the fact that the cows that were housed inside had a lower yield (compared to the expected) that the ones that were in the pasture. Although temperatures dropped at the end of August, they were still above the 20°C. The cows in the pasture apparently were in a cooler environment than the ones housed inside. This can be due to improper ventilation.

Not only during summer, but also during winter, when the cows are housed inside due to the lack of grass in the pasture, temperatures can rise above critical levels when the ventilation is not adequate. In the traditional free stall barns, designed in the 60's of the past century, the ventilation system is not appropriate for the high yielding cows of the 21st century.

Although hot temperatures (> 25°C) are not common in the Netherlands, even moderate summers have enough days with temperatures exceeding 20°C, which is lowering the milk yield as shown in the study we conducted the summer of 2003. We therefore advise to maximise ventilation and implement cooling equipment in the barns. During sunny summer days it is better to provide shade or house the cows inside, in an insulated barn.

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