

Cooling cows improves cow's welfare and production sustainability

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Cooling cows has become a common practice in many dairy sectors in the world, especially in warm regions. Usually we evaluate the benefits of cooling cows according to its effect on productive and reproductive traits and the increase in farm's economical profit. Recently other factors have grown in importance, among them the impact of heat stress and cows cooling on animal welfare and the environment.

In the future dairy farms will be evaluated not only for their economic efficiency, but also for the way farmers treat the cows and farm's contribution, through its production process, to the liberation of greenhouse gases to the atmosphere and therefore, their impact on global warming (1,2).

The impact of cow cooling on the environment

Usually high production level, partially reached through cooling the cows in the summer, can be beneficial to the environment. Daily methane gas production per cow and per kg of milk produced by high yielding cows (averaging over 11,000 kg milk per year), stands at 40% of that of the low producing cows, usually maintained in pasture part of the year (averaging near 6000 kg of milk per year).

In a study we carried out in Israel recently, "Green house gases emission balance" was calculated for the cow cooling practices used on the dairy farms. The increase in CO₂ emission to the atmosphere, due to the use of electricity for fans operation in the cooling process, was compared to the expected reduction in CO₂ equivalent emission to the atmosphere, due to the reduction in number of cows and heifers required to produce a determined amount of milk. Improved production efficiency and the reduction in herd size by 5%, due to the increase in milk production, related to cooling the cows in summer, reduces CO₂ emission by 320 kg/cow/year. This reduction was found to be double of that emitted in the cooling process by the operation of fans and wetting systems (160 kg/cow/year). In case that the expected increase in annual production due to cooling will reach 10% (a common result in many dairy sectors in hot regions), the reduction in CO₂ emission will reach 4 times that emitted during cooling process.

Cooling cows in summer, in addition to its beneficial economical effect on increasing production efficiency and reducing seasonal discrepancy in milk supply, was found to also be environmentally friendly, by reducing dairy sector contribution to greenhouses effect and global warming.

The impact of cooling on cows welfare

In recent publications we have described the high cost-effectiveness of intensively cooling the cows in the summer to mitigate heat stress. There is no doubt that cows need intensive cooling in the

summer, but does this process and the need to move cows frequently and make them stand more hours per day to be cooled negatively affect their welfare? The frequency of “moving” the cows to the holding area and the long periods they spend standing in it, brought Israeli researchers from the Ministry of Agriculture Research Organization, to investigate whether such relief procedure deprives cows of required rest (3). Forty two adult high yielding cows were divided into two cooling treatments groups. Both groups were cooled by combining 30 seconds wetting every 5 minutes and forced ventilation, for 45 minutes per treatment period. One group was cooled 5 times per day and a total of 3.75 hours (5T), while the other group cows were cooled 8 times per day and a total of 6 hours (8T). Sophisticated equipment connected to the milking system monitored milk production, feed intake, body temperature, cows resting and rumination time. Results are described in Tables 1 and 2.

Table 1 – effect of length of cooling time on cow’s temperature, feed consumption and milk production.

| Parameter | 5 cooling sessions | 8 cooling sessions | P< |
|--------------------------------|--------------------|--------------------|-------|
| Rectal Temperature (Morning) C | 38.5 | 38.35 | 0.001 |
| Rectal Temperature (Evening) C | 39.3 | 38.22 | 0.001 |
| Respiration rate (Morning) C | 55 | 49 | 0.001 |
| Respiration rate (Evening) C | 83 | 50 | 0.001 |
| Rumination time (min/d) | 410 | 440 | 0.001 |
| Dry Matter Intake (kg/d) | 24.7 | 27.0 | 0.001 |
| Milk production (kg/d) | 36.6 | 40.1 | 0.001 |

Table 2 – effect of length of cooling time on cow’s laying and rumination time.

| Parameter | 5 cooling sessions | 8 cooling sessions | P< |
|-----------------------------|--------------------|--------------------|-------|
| Cooling time (min/d) | 225 | 360 | - |
| Total laying time (min/d) | 475 | 485 | 0.004 |
| Total activity time (min/d) | 132 | 149 | 0.001 |
| Standing time (min/d) | 834 | 806 | 0.001 |

As expected, increasing cooling time increased feed consumption by 2.1 kg/d (8.5%) and daily milk production by 3.4 kg/d (9.3%). Body temperature and respiration rate were significantly lower in 8T cows, compared to 5T ones (+ 0.8 C and + 30 respirations per minute at noon time). Unexpectedly, cows that were intensively cooled and were obliged to stand for longer periods in the “cooling area”, laid down for more hours per day. If we exclude “obligatory standing time” in longer cooling period cows, they were found to lay down for almost 10% longer during the 24 hours, as compared to the shorter cooling period ones. Ruminating time was also increased by 6% in cows of the longer cooling period group (445 and 415 minutes per day, for 8T and 5T, respectively).

What we can learn from these results is that intensively cooling high yielding cows in summer, not only improves their productivity, but also improves their welfare. Heat stressed cows usually tend to stand and crowd while cooling the cows more frequently in extremely hot summer days, allows keeping them in normal thermal conditions for more hours per day, they lay down more time and probably feel more comfortable.

In conclusion, dairy farmers have to know that when cooling the cows they are not only improving their farm profitability, but at the same time they improve their cow's wellbeing, and reduce green house gas emission to the atmosphere, making their farm more environment friendly.

References:

1. IDF annual meeting 2006, Shanghai, China. Special conference titled "Reduction of Greenhouse Gas Emission at Farm and Manufacturing Levels" , Bulletin 422/2007.
2. First IDF Dairy Summit – The heat is on? , Edinburgh, Scotland, June 2008. (Lecture presented by Dr. Torsten Hemme from IFCN institute in the summit).
3. Honig et al. Performance and welfare of high-yielding dairy cows subjected to 5 or 8 cooling sessions daily under hot and humid climate. J. Dairy Sci. 95:3736-3742. (2012).