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The effect of milking parlour´s layout on microclimatic conditions

P. Kunc [(1)], I. Knížková [(1)], A. Dostálová [(1)], M. Přikryl [(2)] and J. Maloun [(2)]

[(1)] Institute of Animal Science, Prague Uhříněves, Czech Republic (e-mail: kunc.petr@vuzv.cz)
[(2)] Department of Technological Equipment of Buildings, Czech University of Life Science, Prague, Czech Republic (e-mail: prikryl @tf.czu.cz)

Abstract The aim of study was to determine the extent to which microclimatic values depended on the milking parlour's design and layout. The experiment was organized in 13 milking parlours divided into two groups. Milking parlours built as independent structures were in Group A. Group B consisted of milking parlours that were a part of a production barn or were adjoining a barn. The parameters measured were air temperature, air humidity, air flow velocity. The results showed that temperatures in milking parlours in Group A and Group B developed differently in response to changes in the outside temperature. A slower decrease of inside temperatures in milking parlours in Group A was found particularly when the outside temperature dropped below the freezing point. Milking parlours of Group A maintained their higher humidity even when humidity levels outside were decreasing. It was not possible to determine any functional dependence of air flow velocities in the milking parlour and air flow velocities outside (in all cases $|r| < 0.1$). This can be explained by the fact that outside walls of milking parlours are a sufficient protection against high velocities of the outside air.

Key words: *milking parlours, air temperature, relative humidity, air flow velocity*

Introduction

Milking parlours are an integral part of dairy farms. A quality of working environment in milking parlour significantly affects a comfort of milkers and procedure of milking (Doležal, 2000). The microclimatic conditions are a very important element of working environment and significantly influence of thermal comfort of milkers (Mathauserová, 2003).

The aim of study was to determine the extent to which microclimatic values depended on the milking parlour's design and layout.

Methods

The experiment was organized in 13 milking parlours divided into two groups. Milking parlours built as independent structures were in Group A. Group B consisted of milking parlours that were a part of a production barn or were adjoining a barn.

During one year the microclimatic parameters were measured indoor in milking parlours and in exterior (E). Air temperature, relative humidity (by digital thermometer TESTO 615) and air flow velocity (by digital anemometer TESTO 415) were measured in operating zone of milkers. The measurements were provided monthly three times during day in every tested milking parlour. The obtained values were processed by Statistica.cz (ANOVA).

Results and discussion

Results are showed in Fig. 1 – 3.

The large correlation was found between air temperature in exterior and air temperature in milking parlours Group A ($r = 0.9285$; $y = 10.7297 + 0.3531.x + 0.01.x^2$) and air temperature in exterior and air temperature in milking parlours Group B ($r = 0.9402$; $y = 9.6862 + 0.392.x + 0.0103.x^2$). Air temperatures in both milking parlours were influenced by exterior air temperatures. But Group B showed a rapider decline compared in Group A. This difference is visible especially in exterior air temperatures below thefreezing point.

The large correlation was found between and relative humidity in exterior and relative humidity in milking parlours Group A ($r = 0.6631$; $y = 44.8411 + 0.4782.x$) relative humidity in exterior and relative humidity in milking parlours Group B ($r = 0.8136$; $y = 31.45 + 0.6245.x$). Relative humidity in both milking parlours was influenced by exterior relative humidity. But Group B showed a rapider decline compared in Group A. This difference is visible especially in the low values of relative humidity in exterior.

The negative small correlation was found between and air flow velocity in exterior and air flow velocity in milking parlours Group A ($r = -0.0895$) and the positive small correlation between air flow velocity in exterior and air flow velocity in milking parlours Group B ($r = 0.0636$). Air

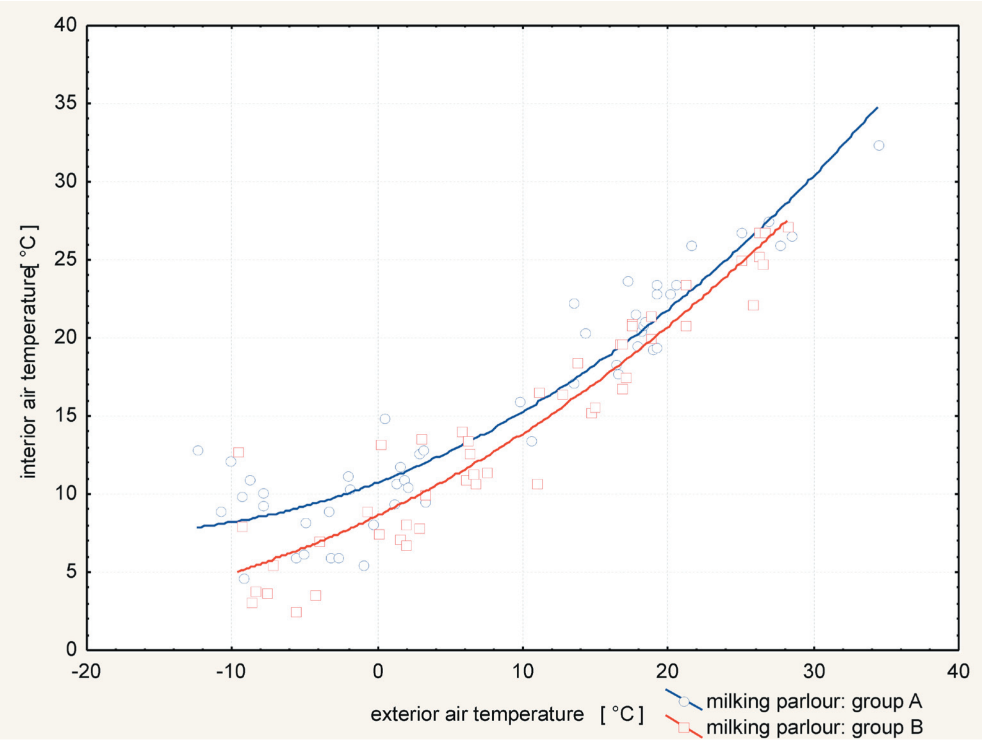

Fig. 1 The dependence of interior air temperature on air temperature in exterior

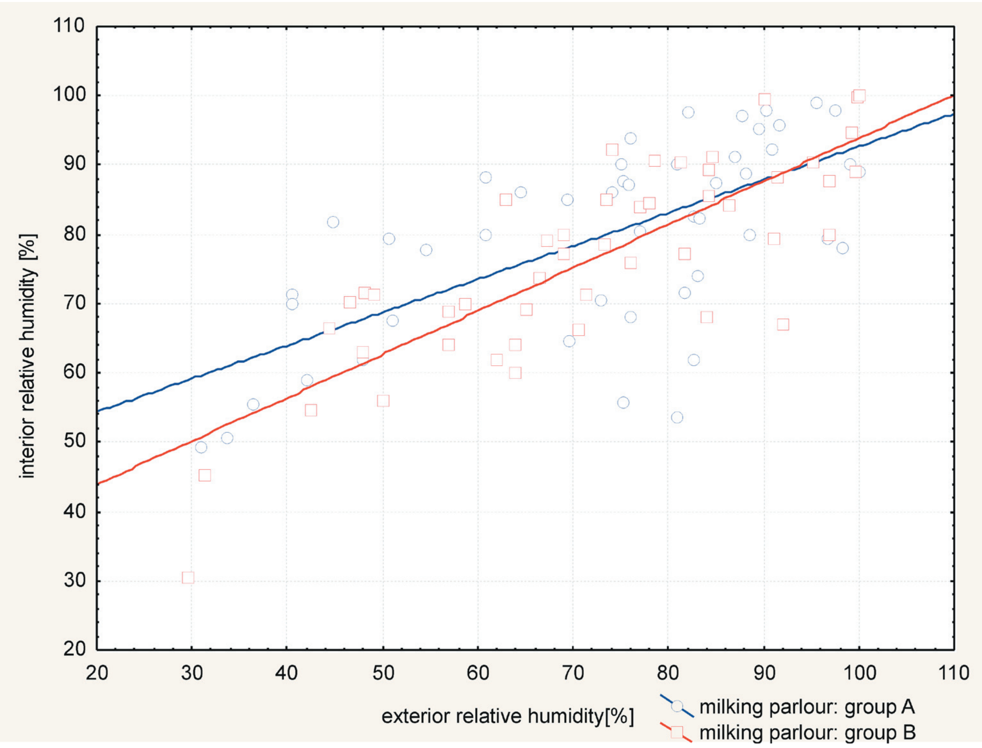

Fig. 2 The dependence of interior relative humidity on relative humidity in exterior

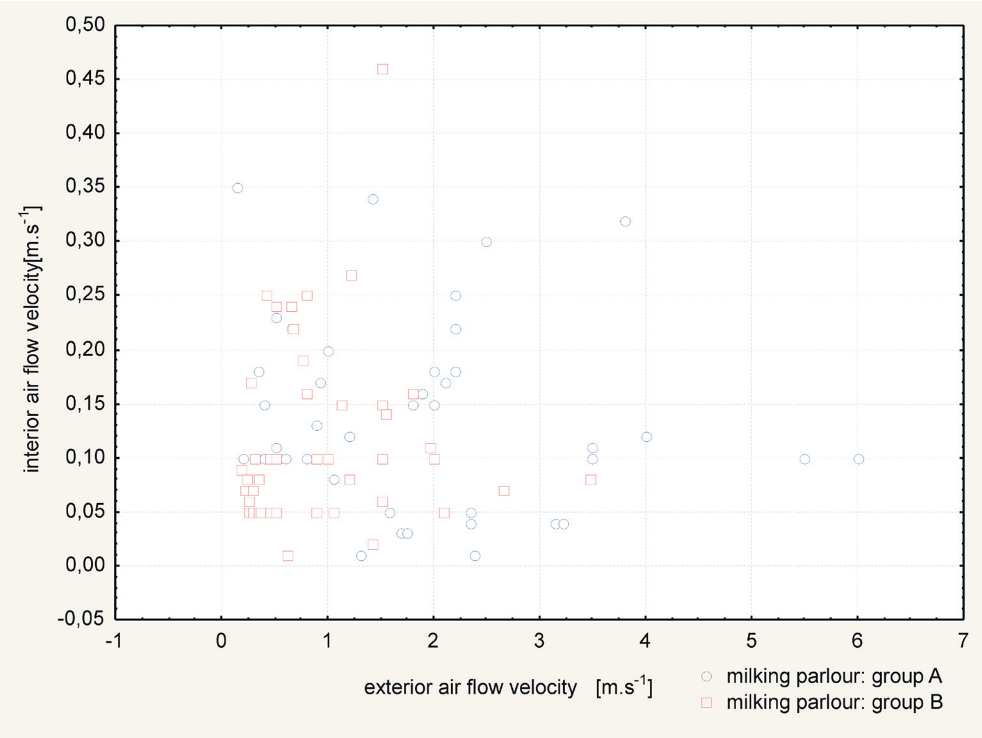

Fig. 3 The dependence of interior air flow velocity on air flow velocity in exterior

flow velocity in both milking parlours was not significantly influenced by exterior air flow velocity.

Air temperature in milking parlours Group B did not accord with recommended air temperatures in winter period. Luymes (1990) recommends minimal air temperature 10°C but Romaniuk, Overby (2003) mention minimal air temperature 14°C in milking parlours. Higher air temperature in milking parlours group A was caused by heating all day long. This heating was not invoked in milking parlours Group B and air temperature was found out to be lower than recommended value in winter period.

Milking parlours of Group A maintained their higher humidity even when humidity levels outside were decreasing. This problem is related to inadequate ventilation in these buildings. Mathauserová (200) recommends the optimum range 30% - 60%. Romaniuk and Overby (2003) cite relative humidity from 60% to 80% for milking parlours. The values 85% is reported as maximum.

It was not possible to determine any functional dependence of air flow velocities in the milking parlour and air flow velocities outside. This can be explained by the fact that outside walls of milking parlours are a sufficient protection against high flow velocities of the outside air. The values of air flow velocity in both milking parlours were found out according to recommended values (Mathauserová, 2000; Tuure 2003).

Conclusions

The results showed that temperatures in milking parlours in Group A and Group B developed differently in response to changes in the outside temperature. A slower decrease of inside temperatures in milking parlours in Group A was found particularly when the outside temperature dropped below the freezing point. Milking parlours of Group A maintained their higher humidity even when humidity levels outside were decreasing. It was not possible to determine any functional dependence of air velocities in the milking parlour and air velocities outside (in all cases $|r| < 0.1$). This can be explained by the fact that outside walls of milking parlours are a sufficient protection against high velocities of the outside air.

Acknowledgements

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