

THERMAL COMFORT OF DAIRY COWS IN BARN WITH OPEN-SIDED CONSTRUCTION

Ivana Knížková¹, Petr Kunc¹, Marie Koubková², Jan Flusser³

¹Research Institute of Animal Production Uhřetěves, 104 00 Praha 10, Czech Republic, phone: 00420/2/67711747, fax: 00420/2/67710779, e-mail: knizkova@vuzv.cz, kunc@vuzv.cz, ²Czech University of Agriculture, phone: 00420/2/24382951, fax: 00420/2/24382946, e-mail: koubkova@af.czu.cz, ³Institute of Information Theory and Automation, Academy of Sciences, phone: 00420/2/66052357, e-mail: flusser@utia.cas.cz

The objective of this experiment was to evaluate the influence of natural ventilation on the thermal comfort dairy cows housed in barn with an open-sided construction with plastic blinds/, by means of the changes of surface body temperature. The measurements by thermography were carried out in 2 stages with cycles, where the open-sided construction was opened or closed fully. The dairy cows responded promptly to these changes by the changes of body surface temperature, the differences in the temperature values were significant. Natural ventilation ensured adequate heat comfort of housed animals. Closed open-sided construction caused undesirable changes in microclimate.

Keywords: open-sided construction, dairy cows, body surface temperature, thermography

Introduction

Animal welfare is one of the basic prerequisites of success in large-scale breeding farms. One of the most important factors that influence animal welfare is the microclimate in the barn which is characterised by the air temperature, relative humidity, air flow and cooling index. Changes in these values may cause excessive stress of the thermoregulatory mechanism, disturb metabolism and lower th

On the basis of this knowledge, the following objectives have been set: to investigate the influence of natural ventilation on the heat comfort of housed cows, evaluated by means of the changes of body surface temperature.

Material and methods

The measurement was carried out in a reconstructed stable (loose housing with cubicle beds and bedding) for 300 dairy cows with natural ventilation and an open-sided construction with plastic blinds during May 1997.

The measurements were carried out in two stages with cycles:

I. stage(ST) - cycles(CY):

1/ 10.00 - 10.30 a.m. - open-sided construction fully opened

2/ 10.30 - 11.30 a.m. - open-sided construction closed by means of plastic blinds

3/ 11.30 - 12.30 a.m. - open-sided construction fully opened

II. stage(ST) - cycles(CY):

1/ 08.00 - 08.30 p.m. - open-sided construction closed

2/ 08.30 - 09.30 p.m. - open-sided construction fully opened

The air temperature (T), relative humidity (RH), air flow (AF) and cooling index (CI) were measured during every cycle.

The changes of body surface temperatures were measured in 12 dairy cows (Czech Pied cattle) by thermovision set AGA 880 during each cycle. The changes of body surface temperature were evaluated in 4 zones: body forepart(BF), barrel(B), hindpart(H) and udder(U). CM-SOFT computer program was used for data and thermograms analyses.

Results

Air temperature, relative humidity, air flow and cooling index were increased and decreased in dependence on closed or opened open-sided construction. The dairy cows responded promptly to these changes by the changes of body surface temperature, the differences in the temperature values were significant between 1. and 2 CY (I.ST) for BF [P< .05] and for B and H [P< .01], between 2. and 3. CY (I.ST) for H [P< .05] and between 1. and 2.CY (II.ST) for BF,B and H [P< .01]. But no significant differences were observed in U.

Results are detailed in the following the chart.

	T	RH	AF	CI	BF	B	H	U	
ST	CY	°C	%	m/s	W/m ²	°C	°C	°C	°C
I.	1.	21.7	49	1.75	336	31.38	31.11	31.04	33.03
	2.	25.2	52	0.08	142	31.85	32.03	32.08	33.39
	differ.	3.5	3	1.67	194	0.47**	0.92*	1.03*	0.37
	2.	25.2	52	0.08	142	31.85	32.03	32.07	33.39
	3.	24.4	46.5	2.00	432	31.37	31.36	31.22	33.32
	differ.	0.8	5.5	1.93	290	0.48	0.67	0.85**	0.07
II.	1.	22.7	68	0.10	156	33.42	33.34	33.18	34.28
	2.	16.2	66.5	0.35	346	31.86	31.91	31.36	33.95
	differ.	6.5	1.5	0.25	190	1.56*	1.43*	1.82*	0.34

* P<.01

** P<.05

Conclusion

In this case, natural ventilation ensured adequate heat comfort of housed animals. Closed open-sided construction caused undesirable changes in microclimate. The dairy cows responded promptly to these changes by the changes of body surface temperature. No significant differences were observed in udder. These responses of body surface temperature in cows to microclimatic factors manifest a very good adaptation to temperature differences.

The observation has proved that the thermographic method is suitable for the evaluation of heat comfort of animals in dependence on the changes of microclimatic conditions in the stable.

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